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THE

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# The CORNELL ENGINEER

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This issue, May, 1947.

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# FLIGHT-TESTING AIRCRAFT EQUIPMENT

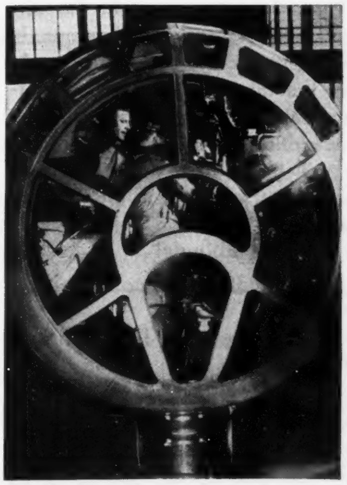
By MARGUERITE E. HARTL, M.E. '45

*All cuts courtesy General Electric*

THERE must be good reasons for spending time and money for testing in the air. Could not this work be done on the ground in a wind tunnel or test cell? Yes, and it is in many cases. However, flight testing offers many advantages over ground work; and it bridges the gap between ground tests and final flights in a production airplane. Equipment can be subjected to the actual conditions which it will later encounter. It is not too difficult to simulate fairly standard conditions of pressure, temperature, and humidity in a test cell, but actual flight brings equipment under some very unusual conditions.

When testing a jet engine, the problem of how to dispose of high temperature exhaust gases must be contended with. If the exhaust gases are not properly removed, they may work back into the entrance stream, and the inlet temperatures may be excessively high. Also, the high ram pressures encountered under actual flying conditions are difficult to obtain on the ground without very expensive equipment. A jet engine may pass over 55,000 cubic feet of air per minute. Another problem peculiar to the testing of jet engines is the noise which they make, an undesirable feature when testing in an enclosed cell on the ground. None of the aforementioned items are problems in the air.

It is not difficult to create rapid changes of ambient conditions when flying an airplane. A power dive will submit equipment to extreme conditions such as it may encounter in future use. It is difficult to get sonic and supersonic speeds in a



**Instruments of all sorts are installed in the plane to record performance data on the equipment to be tested aloft.**

test cell, speeds which now are being studied extensively. Also, it is not possible to get precisely designed equipment when mock-ups must be used for test purposes, which is sometimes necessary on the ground.

But why does flight testing require so many hours of preparation? Starting at the beginning, a request is made for the flight testing of some unit or equipment. This article has generally had bench tests or a number of runs in a test cell under simulated conditions. In other words, the "bugs" have been worked out for the conditions run on the ground. Now, an airplane must be chosen in which to do the flight testing. If an organization has been operating for some time, it generally has some planes on hand from which to choose. If none is suitable, a new plane must be

**THE AUTHOR**

**Now with the Flight Test Division of the General Engineering and Consulting Laboratory of General Electric Company, Marguerite Hartl (nee' Marguerite Haven) registered in Sibley School of Mechanical Engineering in the fall of 1942. She was a member of Kappa Delta sorority and of the ASME, and became Managing Editor of the CORNELL ENGINEER, representing it at a conference of the Engineering Magazines Associated at Northwestern University. She graduated with the degree M.E. in 1945, and has been with General Electric since then.**

**Marguerite E. Hartl**

**Transmission tower and three 24,000 kva, single phase transformers at TVA's Wheeler Dam.**

*—Courtesy Westinghouse*

chosen, and arrangements made for its use.

In selecting a plane, the following factors are considered:

1. The plane must have the performance characteristics required by the test plans. This may mean flying at high altitudes (above 10,000 feet), which should mean pressurized cabins for the men aboard, and supercharged engines. The plane should be able to maintain some preselected air-speed and have take-off characteristics suitable to the airport layout at which it is located. There should be a high safety factor in case of engine failure during take-off.
2. Having found a number of planes with proper performance factors, the next most important requirement must be met, that of suitability for modifications in design in order to carry the test unit, the instrumentation and the crew of test engineers. In some cases the original cowling must be changed, or an additional weight of several thousand pounds will be added. If a military plane is being used, the armament will probably have to be removed. There must be room for special equipment such as temperature recorders, photographic equipment, instrument panels, etc. The comfort of the men aboard should also be considered.

If testing a complete power unit which is to replace one of the plane's regular units, it is desirable to have a multi-engined plane in order to have flying power in case the test unit should fail. Also, in the testing of the new unit, it may be necessary to stop and start it at any altitude. For example, jet engines are tested for "windmilling" characteristics and for minimum idling speed.

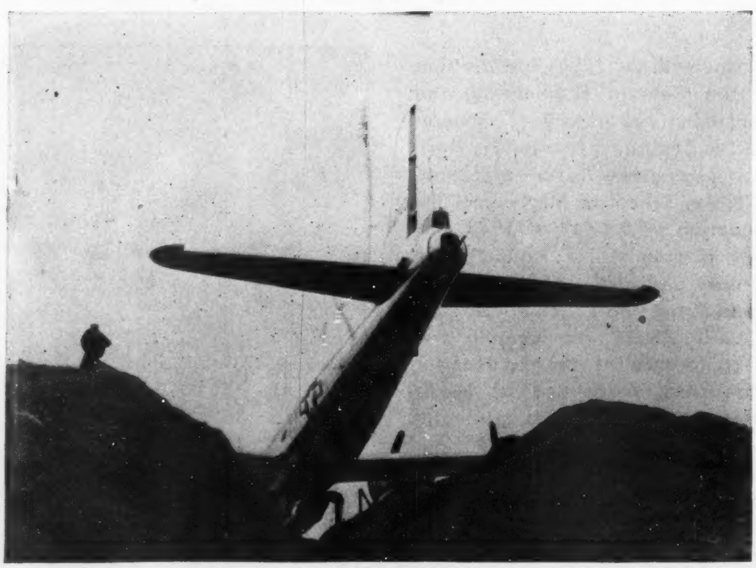
**There is a tenseness in the air. Men look at each other, smile faintly, and cross their fingers. At last, the moment has arrived. After weeks and weeks of intensive preparation, a few minutes in the air will tell the story. Yes, there is a long story behind flight testing. These men aren't on a joy ride at 35,000 feet altitude!**

As soon as a definite plane has been chosen, engineers proceed to design the installation layouts and the instrumentation set-up along with safety precautions. The airplane manufacturer must be consulted about weight and balance problems and modifications in the original design. Provisions must be made for the instrumentation equipment. The instrument wires and pressure lines must be easily accessible and designed with an eye to quick disconnection when the equipment being tested must be removed for repairs or modifications.

**Engineers check instruments which will give data on a jet engine installed in the bomb bay of a B-29.**

Many hours of work are required to install the equipment and prepare it for flight. Simultaneously, the airplane must be given its regular maintenance work and any faulty operations corrected.

**A B-29 "flying laboratory" is backed over a ground test bed for a pre-flight test of a new jet engine.**



### Ground Tested First

And still before the equipment is operated in the air, it must be run on the ground in its new installation. When the operation is deemed successful, the flight is made. Considering all of this time and energy, one hour of testing in the air may cost many thousands of dollars, depending on what is being tested.

The first flight may not be successful. Then come many more hours of changes and work if the trouble is serious. Sometimes the work has to wait until some calculations are made before the trouble can be determined. And then the performance data may indicate a change in design before another flight is warranted.

(*Continued on page 26*)

# PROFESSOR EMERITUS WILLIAM N. BARNARD

*HIS LONG CAREER TELLS THE PROUD STORY OF THE GROWTH OF THE SIBLEY SCHOOL*

The long career of one of Cornell's most distinguished alumni and faculty members came to an end when Professor Emeritus William Nichols Barnard died in Memorial Hospital last April 5. Associated with Cornell since 1893, Professor Barnard was for nearly ten years Director of the Sibley School of Mechanical Engieering. He would have been seventy-two on April 24.

Professor Barnard literally grew up with the School of Mechanical Engineering, from its start as an insignificant school of Mechanical Arts to its present respected position in engineering education. About 1890 Professor R. H. Thurston began, at Cornell, to place engineering instruction on a scientific basis and to develop a mechanical laboratory. Three years later, Professor Barnard entered Cornell, and during his college days, the M.E. curriculum consisted mostly of shopwork, drawing, and lectures; it was often completed in three years by attending summer school.

Graduating in 1897, Professor Barnard served as an instructor in the Machine Design Department until 1900, when he left to go to Indianapolis, where he was employed as a designer of municipal pumping engines. From there he traveled to the small town of Massillon, Ohio, this time to become a mechanical engineer with the Russel Engine Company. In 1903, he returned to the Machine Design Department and was given an assistant professorship.

After his return, he rose steadily and rapidly. Appointed Professor of Steam Engineering in 1907, he served as Secretary of Sibley College under "Uncle Pete" Smith, then Dean of Sibley College. He became head of the Department of Heat-Power Engineering in 1920, and it was under his direction that the option on design of steam-power plant equipment in M.E. was inaugurated. Professor Barnard personally gave the option, and he guided men who were to become outstanding in the field. After two years as Acting Director under Deans Diederichs and Hollister, he was appointed Director of the Sibley School of Mechanical Engineering in 1938.

He rendered extraordinary service during both World Wars. Soon after the United States entered the first World War, Professor Barnard was appointed President of the "Academic Board of the U. S. Army School of Military Aeronautics." He did similar work in coordinating the University's civilian pilot training program during World War II. But more important was his sacrifice in continuing his work as Director of the school during the war years when his experience was most vitally needed. He kept working tirelessly, retiring only last June, despite failing health and the fact that he had long passed retirement age, and this extra burden undoubtedly hastened his death.

In the field of technical education, Professor Barnard especially distinguished himself. His three volume treatise on heat-power engineering, written in collaboration with late Professor C. F. Hirshfeld and Professor Ellenwood of the Cornell faculty, is a standard textbook in the field. He is also the author of *Valve Gears,* which was extensively used until the advent of Diesel engines.

Professor Barnard's interest in Cornell extended to phases other than those concerning the M.E. school alone; the Cornell Cooperative Society, under his leadership as president, was moved from Morrill Hall to its present location in Barnes Hall in 1926. He managed to find time to advise the school publication, *The Sibley Journal of Engineering,* predecessor of today's ENGINEER, and was one of its original incorporators in 1916.

Academic honors and recognition of his scientific contributions are signified by membership in Tau Beta Pi, Sigma Xi, Phi Kappa Phi, and Atmos.

Both colleagues and students remember him as a man who was generous to everyone with his time and energy, and who was always anxious to see that a fair solution was reached on every issue. In the words of President Day, "In his passing, Cornell has lost one of her esteemed elder statesmen and one of her most loyal sons."

**Death is a Problem**
**For Engineers**

# Safety On The Highways

By THOMAS D. LANDALE, CE '48

THERE is no need to present a long dissertation on why we should fear the auto death toll. The accompanying charts speak for themselves. The primary job for all of us is to find out what causes the most accidents, and then correct the causes.

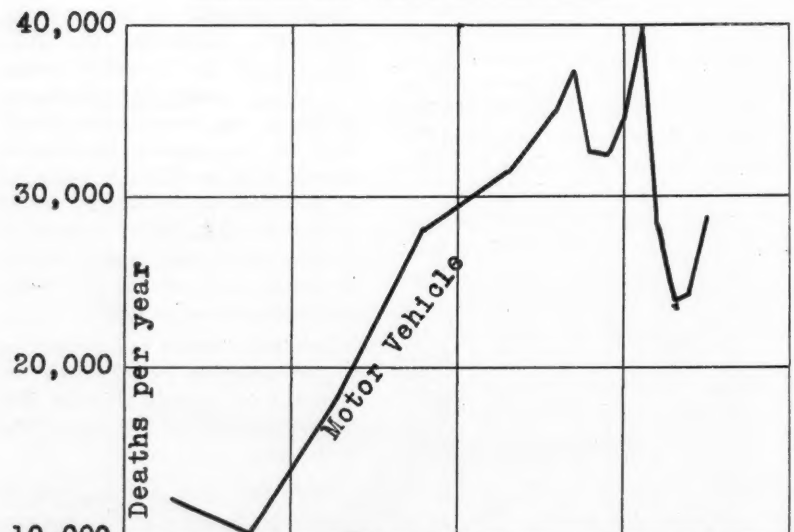
This does not mean that we must drive at 25 m.p.h. all the time because statistics show that traffic deaths occur when one party exceeds that limit, nor does it mean that we must come to a complete stop, get out, and look up and down the track for the potential train at every crossing. Under that set of arguments, we should stop driving altogether, for most certainly the vehicle and driver are the major causes of highway accidents. We should therefore strike a compromise between radical safety and radical time-saving, obtaining both wherever possible.

### Fundamental and Contributing Factors

The fundamental causes of most accidents of any type are carelessness and thoughtlessness. The cures for these evils cannot be explained by mathematical formulas; it is merely the duty of all vehicle drivers and pedestrians to stay alert and to refrain from acting rashly.

The civic leaders must solve the *accident contributing factors,* many of which can be eliminated by advance action, i.e., preventive measures. These *contributing factors* are not the sole causes of accidents—it still takes vehicles and drivers—but by doing away with them, we will surely decrease the highway death and injury rate.

Chart 1
Railroad and Motor Vehicle Accident Fatalities




### Engineering, Economy and Safety

From the strictly engineering standpoint, many highway hazards can be eliminated .The job for the engineer is to make sure that the changes are effective, worthy, efficient, and economical. One state governor* recently told his legislature that he is resolved to enforce rigid economy in the highway department to "accomplish the maximum benefit to highway users." Most of the officials in other states have the same desires, and not very much post-war money is going to be wasted on super-double X-highway, super-safety dreams. The engineer is the professional agent for the state and individuals, and he should be able to determine what should be done, both from engineering—which includes safety—and cost standpoints.

### The Practical Job

Many planners now propose that the engineer's real job is to find the worst and most dangerous intersections and recommend and design grade separations. Full cloverleafs need not be constructed at each separation because minority traffic can go around the block to make a turn.

Another frequently proposed improvement is to make large one-way streets with the next street parallel one-way in the opposite direction. With one-way streets it is possible to make perfect synchronization of light signals, regardless of spacing; such is impossible with two-way streets. This will do the two-fold job of moving traffic in the fastest way possible and will eliminate the lesser but decidedly dangerous intersections. The abil-

ity to turn left without having to dodge the traffic in the no man's land of two-way streets is a distinct safety measure.

### Opportunity

Major General Philip B. Fleming, Administrator of the Federal Works Agency, recently said: ". . . The fact is that many of our highways were designed with little reference to the element of safety. The engineers of 25 and 30 years ago built streets and highways to serve then-existing needs. Primarily the problem and slogan was 'Get the farmer out of the mud." . . .

"Most of these earlier highways are now obsolete and they would have to be rebuilt, regardless of the safety factor, merely to enable them to carry the heavy traffic of today at today's speeds. In the rebuilding we have a priceless opportunity to bring them up to modern safety requirements."

### Old and New Trends

The value of *super* maintenance and design with respect to accidents and safety is, however, to be treated with some skepticism. In taking highway US 30 across the country, one notices scores and scores of the death-reporting black crosses along the fences where the highway is the straightest and smoothest and most beautiful. Also the cities of America where street maintenance is at present extremely poor, the per capita death rates in auto accidents are among the most favorable in the country.

Where Pennsylvania used to make flat curves to slow down country traffic and Iowa used to place intentional dips to reduce speed, the trend, since some years before the War, has been to make highways the best of engineering projects, straight and smooth, and to educate the driver in safety methods, rather than slow him down by obstacle course means.

### Improvement of Design

In building new and rebuilding old highways, there are many improvements over the old systems which should be taken into consideration. Traffic lanes should be wider, as the eight- and nine-foot widths still in use in many places, and the present standard of ten

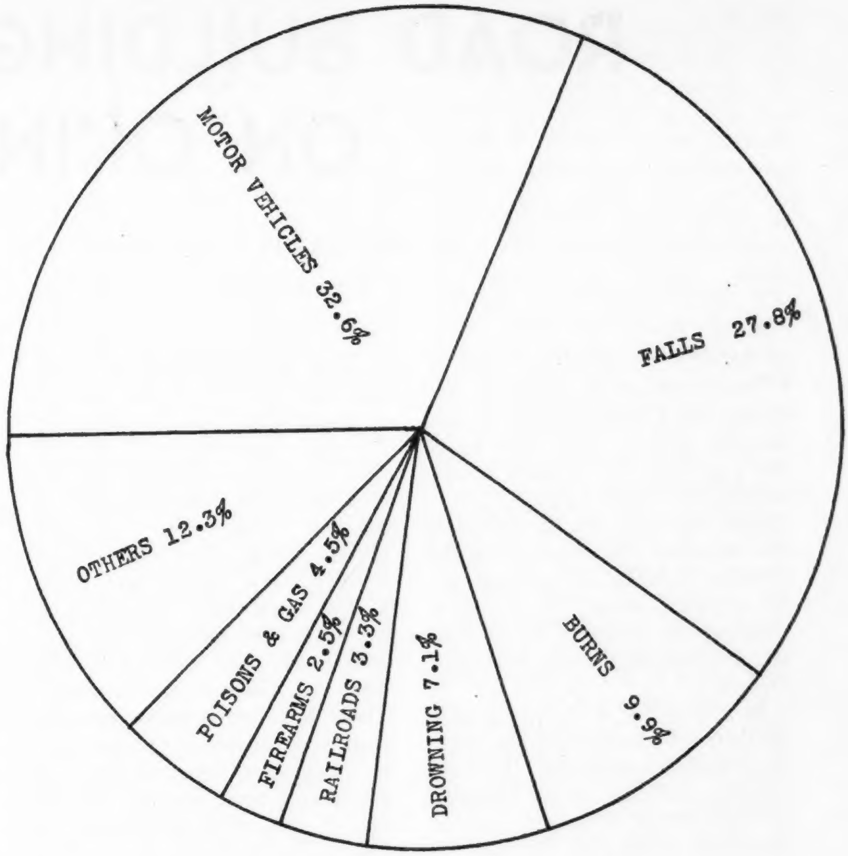



Chart 2

**Breakdown of Accidental Deaths in the United States**

feet are becoming outmoded due to wider commercial vehicles. Expert opinion is now almost unanimous that three-lane highways should be eliminated, as they are among the leaders in *accident contributing factors.* A neglected construction item of the past has been the sidewalks in suburban and semirural areas.

Construction of good local streets parallel to main highways relieves a considerable burden from throughways. Many accidents occur in which a car, engaged in turning on or off a federal highway, is involved. Design of parking areas and walks away from super-highways is an asset for safety's case.

With respect to the details of construction, the trend today is more toward surfacing materials which are satisfactory for all weather. Streets with good foundations, which don't crack with large changes in temperature are of course to be desired. City and suburban illumination is very important and requires much real design on the part of the engineer. He should also recommend the hours for full lighting, half lighting, etc.

Laning a narrow four-lane highway has nearly the same effect as widening and not laning as far as volume of traffic, ease of driving, and safety are concerned. In Vol. 10, No. 4 of the CORNELL ENGINEER an article appeared which presented a paper on the lettering of highway signs. Even by taking heed of how to print the numbers, for night or day, safety is boosted somewhat. Such relatively small jobs, for the engineer to initiate, are well within the budget of any municipality or state.

### Highway Users Recommendations

The National Highway Users Conference* has recommended a uniform code of traffic laws for the entire country. The highlights

(*Continued on page* 30)

# ROAD BUILDING ON OKINAWA

By RICHARD J. GILBERT, CE '50

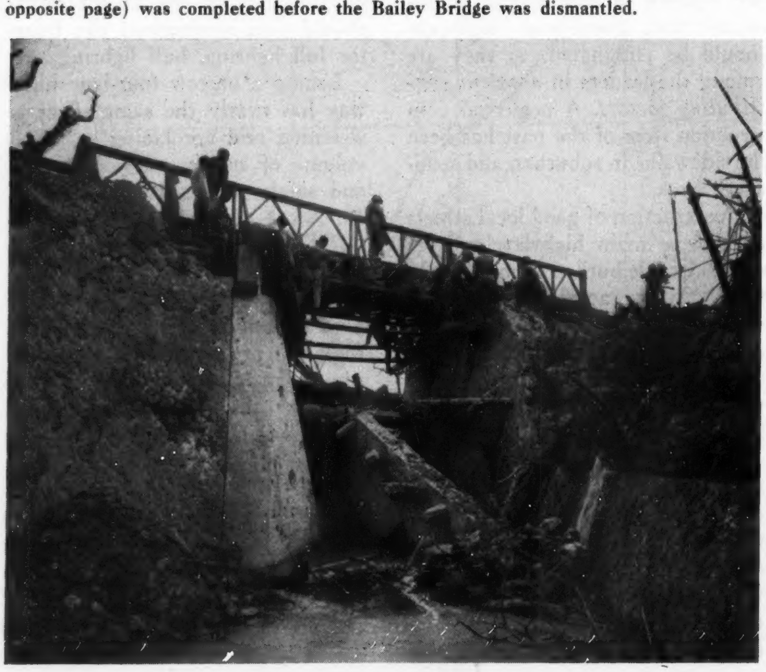
*All photographs by U. S. Army Signal Corps*

ALMOST everyone has read of the work of the Infantry, Artillery, and Combat Medics in the infantry division. very few know the jobs that the Combat Engineers had to fulfill during the war. Theirs was the role of doing all the unwanted jobs required for the division: building and running water points, blowing mines, constructing the general's bomb shelter, and putting through roads and bridges.

In this article, I shall only take up the road construction job which they faced, specifically, the construction of Route 4 on Okinawa by the 302nd Engineer Combat Battalion of the 77th Division.

When the 77th Division first came to Okinawa from Ie Shima, the engineers were given the task of constructing and keeping open the route over Skyline Ridge. On April 29, 1945 the whole Division took over the central portion of the line across the southern part of the island. The main supply route for this section was Route 4. Up to a point approximately five miles from the front, this route had already been built up by Seabees and Construction Engineers. These last five miles of so-called road were turned over to the Combat Engineers. Most of the road was pretty poor, but the last half mile of road, from the base to the top of Skyline Ridge, was nothing but an oversized trail. As the Gods had been good to us by holding off the rains, the roads were passable.

**Combat Engineers perform preliminary timber work for the replacement of a Bailey Bridge by a permanent structure. The framework for the permanent structure (see opposite page) was completed before the Bailey Bridge was dismantled.**



Our task was to widen this one way trail, which the Japs had built, into a two-lane semblance of a highway. As rain was expected, we were to ditch the road as much as possible, so as to give the water a chance to flow off. This task was made extremely difficult, for the road was cut into the side of the hill. To widen the highway, dirt was cut away by the bulldozers from the up-hill side and pushed across the road to the embankment on the low side. It was impossible to leave the bulldozers near the forward area at night for fear of Jap artillery and infiltrators. So the heavy work was delayed while the operators made the trip up from the rear area every morning. Besides these difficulties, there were the never ending traffic which hindered the bulldozers and dump trucks, and the first real Jap artillery and mines we had encountered in the Pacific.

For the men manning the picks and shovels, ditching and draining the ruts were constant work. The soil in this area is a mixture of mud, clay, and coral which acted together to make digging an almost impossible task. As an expedient, demolitions were used to blow the earth away to form ditches along the side of the roads. But these were only temporary, as the traffic on the unpaved road pushed the dirt back into all the ditching.

### Bad Surfacing

The coral pit we were using to surface the road had one major fault which did not show up till the rains began. The material which was dug from this pit was a 50-50 mixture of dirt and coral. As long

**A line man digs for a culvert in a sea of Okinawa mud.**

as the dirt was dry, this mixture made fine surfacing material. But when the rain came it turned the dirt to mud. The coral was pushed to the bottom, leaving nothing but a mud hole that was worse than when we started.

Just as it looked as though we were making some progress, two factors entered the picture which practically undid all our work. The Jap line gave back a few miles and the rains began. Our section of the road was not fixed, but ran from the front to a couple miles back. In fact it was our policy to go up to the fox holes each morning to make sure the line had not advanced and thus pushed our area of construction forward. This pushing forward of the lines gave us just that much more Jap trail to attempt to turn into road. These rains turned all roads which did not have a good base and a half a foot of pure coral as surface, into a sea of mud.

The new section of road, which we had inherited, soon became impassable due to the rains. To top the situation off, part of the roadway caved in. This was due to the fact that the Japs had dug some of their positions under the road. Water had weakened the walls of their tunnels and heavy vehicles just pushed the entire works in. The only solution was to build a temporary by-pass along the top of the ridge so that we could work on the highway without traffic being in our way. This by-pass was built along the top of the ridge, above the highway which at this point ran along the base of the hill. While two bulldozers were used to pull the traffic through the three feet of mud that constituted the old road, two were employed to cut through the new by-pass. For the first time in the battle, our battalion's road construction program was put on a 24-hour schedule, even though mopping up operations were going on in the area of construction. Carbide lamps were used to supply the illumination for these night operations. This by-pass turned out to be a time consuming job. Working night and day, it took two bulldozers four days to cut this single lane, quarter of a mile road. The mud situation, even on the top of the ridge, was so bad that the bulldozers were sometimes bogged down.

### Shuri Captured

By the time this by-pass was completed, it was flooded with traffic; for Shuri, about a mile further up the road, had been taken. At this time, all the line companies moved into the wreckage of this former strong point in the Jap line. It was a simple matter to put in a temporary road through the city.

With the major part of the Division not participating in the final stages of the battle, the Engineer Battalion was free to do some real road construction. The battalion was assigned the job of making an extra-wide, two-lane, coral surfaced highway from Skyline Ridge through the remains of Shuri. This route took us through the area that had seen the heaviest fighting on the island, and thus the whole section was nothing but a mass of rubble and stubs of trees. For the first time since the battle began, we could make some real progress in the building of a permanent road. Coral pits with an excellent quality of coral could be opened, carryalls could be used to dig ditches, graders could level the surface, and the dump trucks could make many more trips a day from the pits to the construction area.

The work-horse bulldozers took on a new task. Their blades were removed and carryalls were attached to their rears. With these carryalls, they were able to make ditches six feet wide and three feet deep, so

*(Continued on page 26)*

**Completed permanent wooded bridge which replaced the Bailey Bridge on the opposite page. Infantrymen are moving up for the final phase of the Okinawa battle. Shuri is just around the corner from this bridge. Famed Skyline Ridge is on the horizon.**

Nuclear Research Project

# CORNELL BUILDS A SYNCHROTRON

THE "Astounding Science-Fiction"-like gadget pictured below is a model of the new 300 million electron-volt synchrotron which will soon be producing mesons in the immediate region north of Bailey Hall.

The synchrotron will be the basic research tool in a study at Cornell of the atomic nucleus and nuclear forces. Because of the importance of the work, the Navy Department has granted Cornell 500,000 dollars toward the cost of the machine and its associated equipment.

It is hoped that the new synchrotron, which will be about 12 feet in diameter and which will weigh close to 70 tons, will produce mesons in the laboratory in greater quantity than has been available in the past. Before the development of apparatus such as this, physicists were forced to rely mainly on cosmic rays as the meson producing source.

### Seek Clue to Nucleus

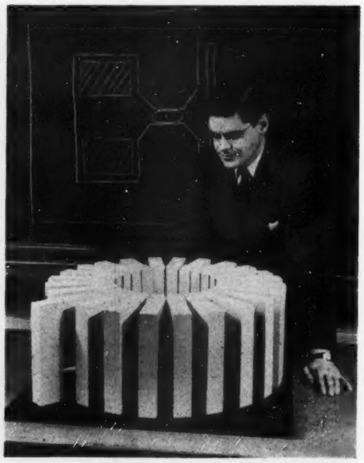
Through the study of mesons, which are particles in the atom thought to be related to the forces which hold the nucleus together, Professor Robert R. Wilson, newly appointed director of the Laboratory of Nuclear Studies, and his fellow physicists hope to obtain a clue to the fundamental problem of nuclear forces. The only known facts about the forces which hold the atom nucleus together, Professor Wilson has said, are that the forces are stronger than electrical forces, and much stronger than gravitational forces. Some information has been obtained from experiments with ordinary nuclear physics equipment, but to learn more it is necessary to turn to nuclear particles of very much higher energy—in the range of hundreds of millions of electron volts rather than just a few million. The synchrotron is expected to accelerate electrons to about 300 million electron volts, which should be sufficient for the production of the mesons.

The production and study of mesons is only one of the experiments planned for the synchrotron. Another important study will be an investigation as to whether electric forces still follow the laws formulated at lower energy levels when the energy is increased to the 300 million electron volt limit of the machine.

### Cost Is $300,000

There is already a 70 million volt synchrotron in operation at General Electric and there are other 300 million electron volt models under contruction at the University of California and at MIT. The value, in monetary terms, of the equipment is well illustrated by the fact that the magnet, coil and condensers, alone, of the Cornell synchrotron is estimated to cost in the neighborhood of $300,000.

**Professor Robert R. Wilson studies a model of Cornell's new 300 million electron-volt synchrotron.**



Professor Wilson will head a large group of prominent physicists, including the eminent Professor Hans A. Bethe, widely known for his theory of the source of solar energy, and more recently as head of the Theoretical Physics Division at Los Alamos on the atomic bomb project; Professor Lloyd P. Smith, chairman of the Department of Physics and Department of Engineering Physics, and associate director of the RCA Laboraties in Princeton during the war; Professor L. G. Parratt, head of the Engineering Division Research Unit of the Naval Ordnance Laboratory in Washington, and later on the Los Alamos staff; Professor B. D. McDaniel, on the staffs of the Radiation Laboratory at Massachusetts Institute of Technology and Los Alamos Laboratory during the war; Professor Philip Morrison, senior physicist at the Metallurgical Laboratory in Chicago and at Los Alamos.

Professor Richard P. Feynman, formerly of Princeton and a group leader in the Theoretical Physics Division at Los Alamos; Professor Dale R. Corson, formerly of the M.I.T. Radiation Laboratory and the Los Alamos staff; research associates Charles P. Baker, Ernest D. Courant, John W. DeWire, and Charles D. Swartz, all of whom had important war-time assignments. Professor Franklin A. Long of the Cornell Department of Chemistry, who has returned to Cornell after several years with the National Research Committee, will also be a member of the group.

Other additions to the staff are expected. Professor Robert F. Bacher, former head of the Laboratory of Nuclear Studies, is presently serving on the U.S. Atomic Energy Commission.

# PROFILES

## George Winter, Ph.D. '40

After the European custom of studying at several colleges, Dr. George Winter, a native of Vienna, Austria, was educated at the Universities of Stuttgart and Vienna and the Munich Institute of Technology, where he graduated in 1930 with the degree of Civil Engineer. Mr. Winter completed his training in four years although the customary duration is from five to seven years and more, depending on the diligence of the student. Under the European system of education there is much opportunity for personal initiative and almost no supervision; only two comprehensive exams are given whenever the student is ready for them, and in addition, class attendance is not compulsory. European universities place exclusive emphasis on instruction, and campus activities are at minimum.

For two years after his graduation he was engaged in the design and erection of reinforced concrete structures in Vienna. In 1932, at the height of the depression, the firm for which he was working folded up. He and his wife, Ann, decided to go to Russia, where he had been offered a position as division engineer on the construction of a meat-packing plant at Sverdlovsk, in the Ural district, U.S.S.R.

George Winter

Concerning his work in Russia, Professor Winter says briefly that although the standard of living was particularly low at the time, no engineer of his age could hope to find anywhere else the opportunities for experience in the structural design of industrial plants that could be found there. While the native Russian engineers were young and inexperienced, the nation absorbed

(*Continued on page* 38)

## C. M. Chuckrow, C.E. '11

**Charles M. Chuckrow**

Charles M. Chuckrow, prominent in the field of real estate and construction in New York City, came to Cornell from North Adams, Massachusetts, and graduated from the School of Civil Engineering in 1911.

Chuck, as he is known to his friends and colleagues, got his first taste of after-college life with the N. Y. Central and Hudson River Railroad, serving as rodman in the engineering department. Soon afterward he became assistant engineer in the New York State Engineer's Office. He furthered his experience in public construction when he later accepted a position as assistant engineer for the Public Service Commission, working on subway construction in New York City. In 1916, Mr. Chuckrow was employed as a building estimator by Fred T. Ley and Company, New York. Showing great promise and energy, he succeeded to the position of general manager for that company in 1923, and in 1929 he became executive vice-president. In 1933 Mr. Chuckrow became president of the Fred F. French Company, engaged in real estate and construction. From 1936 to 1940 he was president of the Fred F. French Operators, Inc., as well.

During the war, Mr. Chuckrow served on the War Department Price Adjustment Board and in the U. S. Engineers. At present, he is associated with the Tishman Realty and Construction Company. In the construction business for most of his life, Mr. Chuckrow was engaged on the 70-story Chrysler Building, the Westinghouse Building, the Fisk Building, and many other office buildings in New York. He has worked on several housing projects, and industrial plants for such companies as General Motors, Eastman Kodak, Warner Brothers, and the Atlas Powder Company. In addition, his projects include many hospitals, college buildings, banks, and power plants. At present his construction activities are in connection with an office building occupying a block front of Park Avenue and a cooperative apartment house.

Mr. Chuckrow's engineering experience qualified him for election as President of the Cornell Society of Engineers, and as an associate editor in the preparation of the textbook "Reinforced Concrete and Masonry." He is a member of the Engineering College Council at Cornell. His name is listed in "Who's Who in Commerce and Industry."

Mr. Chuckrow and the former Mollie Alexander Goldenberg were married in 1914. They have two sons, Robert, and Charles M. II, and one daughter, Mrs. Hubert K. Simon. Mr. Chuckrow indicated his civic interests when, as a member of a committeee of the Commerce and Industry Association, he helped to draft and obtain passage of the law which founded the Urban Redevelopment Corporation. He is a member of the Bankers' Club of America, the Building Arts Institute, and the Cornell Club, all of New York.

## *The Editor's* COLUMN

### What Price Engineer?

*Annual tuition in the College of Engineering will increase from $500 to $600 in the Fall; other endowed colleges from $500 to $550.*

Here is your proof that the engineer is an expensive investment, that an engineering education today is a costly affair. But why is it so costly?

The faculty in all colleges have not had salary adjustments in keeping with the times. The students' demands for better instructors and profs can be met by raising faculty salaries, but not by raises only.

The increased enrollment is multiplying costs. Educating a single student requires *over $1000 per year.* More students mean more of an expensive item for the University.

Contrary to popular belief, none of the increased tuition is going toward building funds.

The engineers are saying, "Why is our tuition going up $100 compared with $50 for those Arts students?" New equipment needed, operational costs, and instructors for expanding lab courses deplete a large section of the engineering budget. The majority of Arts students are required to take only one year of science, and their lab courses are a minimum.

In view of the facts, not much of an argument can be made against the increase in tuition. The high cost of education is bound to be felt, especially by the student engineer. But the University is prepared to help the student in need with several methods of financial aid—scholarships, loans at reduced interest rates, and part-time emploment.

The University intends—we hope this intention will become a guarantee—that any deserving student shall not be deprived of his education by this added tuition.

# PROMINENT

**Joe**

### Joseph E. Nemeth, ME

"Ll'l Joe" gave his first howl on July 20, 1923, and hasn't stopped since, even though his mother said he was a very quiet baby. New York City didn't know it, but another ME was launched that day. Joe breezed through the scientific course at Stuyvesant High; and before he left, the President of the Chemistry Society, Editor of the Chemistry Magazine, and Vice-president of the Camera Club were all named Nemeth. While in high school, Joe aspired to be a Chem E, but was luckily saved from "that fate wuss than death." He received the clue before he took that fatal step, and from then on, he was destined for the "salt mines" of Sibley.

The Ford Instrument Company of Long Island City ("only a twenty minute walk from home") had Joe's name on its payroll for the two and a half years before coming to Cornell.

In 1943 he decided it was time to get some "book-larning," so he came to Cornell in November with a McMullen Industrial Scholarship and a practical background in ME. Once here, Joe lost no time in competing for the CORNELL ENGINEER. In his sophomore year he was elected to Circulation Manager, and peddled the ENGINEER in the Straight lobby. For his reward, he inherited all the headaches of the Business Manager for two years.

Joe spends his spare time twisting dials at the Cornell Radio Guild station and going to A.S.M.E. meetings. He is also a member of the American Society for Metals and Pi Delta Epsilon. In his senior year, Joe was appointed as an assistant in the Department of Engineering Materials and has been gleefully busting out classmates.

The first thing Joe plans to do upon graduation this June is to marry a gal named Leanna and "settle" down. She is a chemist, and he plans to make his niche as a Production Engineer. Here's to success—we're sure he'll achieve it.

### Robert D. Loucks, CE

One of the busiest men these days around Lincoln Hall is Bob Loucks, senior Civil Engineer. A member of Chi Epsilon, Rod and Bob, Tau Beta Pi, and A.S.C.E., Bob also finds time to help publish the Lincoln Log.

His story starts in the ranch lands and Indian reservations of South Dakota, where he was born in 1925. Later he moved to the state capitol, Pierre, and attended the small high school there. Preferring sports to the classics he played football and basketball, and

**Bob**

# ENGINEERS

as he says, "found a few other excuses to keep away from books and classes."

Upon graduation from high school he entered Iowa State College. No sooner had his luggage arrived there for his first term, than he was called into uniform by the Marines and sent to Notre Dame for study. He acknowledges having worn the uniform all right, but, as for the other, he makes no claim. However, the Marine Corps thought him a promising student, and sent him here to Cornell for Engineering training. After sixteen months at Cornell he was sent to South Carolina. He spent several months there and was then placed on inactive duty. During the summer of 1946 he worked for the United States Bureau of Reclamation. In the fall Bob returned to school in Lincoln Hall to start his senior year.

### J. Coleman White, E.E.

J. Coleman White, and that's all there is to that first name, came to Cornell from La Porte High School, La Porte, Indiana, to earn a Bachelor of Electrical Engineering degree. This goal will be achieved in June of this year, having been interrupted for three years while 2nd Lt. White navigated a few of Uncle Sam's bombers around.

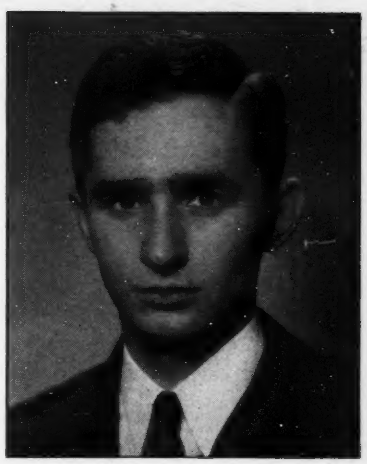
It may be sacrilege to tell this, but his true love does not lie in electrical engineering. It lies in classical music, and in particular, the piano. Fate made it impossible for J to follow it as a career by giving him a hand that was just a little too small. To satisfy his own curiosity as to his engineering aptitudes, he took the examination given by the Veterans Administration and discovered he was in the lower 20 percentile. It is lucky he found this out in his last term instead of his first, when it might have deterred him from compiling the best average in his class, and one of the best in the history of the school.

J's college career was limited by no means to merely acquiring this average and playing the piano. He has kept himself busy with a few extra curricular activities, such as the band, orchestra, Alpha Phi Omega, and in winning his numerals as a member of the freshman crew. He is a member of Phi Kappa Psi fraternity, Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi, in addition to Crew Club and Sphinx Head. These evenings find him hurrying from his afternoon labs to the boat house, since he is also manager of the varsity crew.

J.

### Samuel I. Hyman, ME

Back in September, 1941, the loungers in front of the Ithaca Hotel were surprised to see two dusty boys on bicycles complete with bedding rolls come down the Aurora Street hill. Sam Hyman and another prospective engineering student had just completed a three-day trip from New York by way of Philadelphia. Since that time with a few years out for military service, Sam on his bike has been a familiar figure on the quad.



Sam

As would be expected, Sam joined the Cornell Outing Club as a Freshman. His second term he became a compet for the Business Board of the CORNELL ENGINEER.

At the end of the Spring Term in 1943 the ERC called him to active duty. In December, 1943 Sam was sent to Pratt Institute in Brooklyn under the ASTP; when this program ended in March, 1944, he was sent to the Seventy-fifth Infantry Division with which he subsequently saw much action in France and Germany, including the Battle of the Bulge.

Sam resumed his career at Cornell in March, 1946. He rejoined staff of the CORNELL ENGINEER and at the end of the term was elected Publicity Manager. This fall he was made President of the Railroad Club. Although Sam's main hobby is railroads, he spends many hours with his camera and large map collection. But don't think he devotes himself solely to his activities, letting his studies slide, for he has an enviable scholastic record. In addition to his duties as an assistant in the Engineering Materials Department, he is now working on the Shephard hardenability test for shallow hardening steels. After graduation Sam's interests point to a career in either metallurgy or heavy machinery.

# News of the College

## Contest

Alvin L. Feldman ME '49, was awarded the first prize of $25 for presenting the best paper before the student chapter of ASME in a contest held on April 23. The title of his paper was "The Atomic Powered Athodyd." Feldman is the author of an article on that subject which was published in the April issue of THE CORNELL ENGINEER. Second prize was awarded to David K. Felbeck ME '48, for his paper on Saint Venant's Principle. Jarman G. Kennard ME '47, took third prize with a paper on the turbo-supercharger. The board of judges included both students and members of the faculty.

## Prizes

Four Charles Lee Crandall prizes, of $75, $50, $35, and $20, are to be awarded again this year to Junior or Senior civil engineering students, for the most meritorious papers on appropriate subjects. The prizes were established in 1916 by alumni of the School of Civil Engineering to encourage original research, stimulate interest in matters of public concern, and make the students aware of the opportunities open to them of serving their fellow citizens. The Committee in charge of the Prizes this year consists of Professors Lincoln Reid, John E. Perry, and Carl Crandall.

## Hollister Limits Duties

Because of illness resulting from overwork, S. C. Hollister, dean of the College of Engineering and vice president in charge of University development since May, 1946, has asked that he be relieved of the latter position, so that he may devote full time to the work of the engineering college.

Dean Hollister was granted a leave of absence, and went with his family to Sanibel Island, Florida, for an extended rest. Professor Walter L. Conwell, Assistant Dean of the College, served in his absence as acting dean.

In announcing Dean Hollister's withdrawal from the office of vice-president, President Day expressed the warm appreciation of the Board of Trustees for the service which Dean Hollister had rendered, and stated that the resignation had been accepted with deep regret on the part of the administration.

## Tau Beta Pi

The Executive Council of the National Tau Beta Pi Association, honorary engineering society, recently appointed Robert H. Nagel, '39, full-time secretary-treasurer of the organization. He will assume his duties August 1, 1947.

Soon after his graduation, Mr. Nagel was employed by the TVA at Knoxville, Tennessee. He received the degree of M.S. in C.E. from the University of Tennessee in 1941. During the year 1943-44, he was assistant professor of civil engineering at the University of Tennessee. Prior to his appointment as national secretary-treasurer, Mr. Nagel was assistant engineer on the Southern Railway. During this time he served as assistant secretary-treasurer of the association and editor of its magazine, "The Bent."

## Students Hear Karapetoff

Dr. Vladimir Karapetoff, Professor Emeritus of Engineering, spoke on March 6 at the Engineering Societies Building in New York City to the New York Section of the American Institute of Electrical Engineers in a talk directed to members of the ten student branches of that organization in the New York area.

Dr. Karapetoff's subject was "The Young Engineer and Human Society"—a thought which he elaborated on with five main postulates. These points which he stressed were that the young engineer should gear himself to the important factors in his life, that a person's quest for greater knowledge should be continuous throughout his life, that a person should accomplish as much as possible of his plans and ideas during his life, that one should develop all sides of his character equally, and that one should remember the fact that time and opportunity never return and are lost forever once passed by. His final word of advice to the group of students dealt with the last-named topic, his warning being that of all the sad words of tongue or pen, the saddest is "it is too late."

## ASCE

At a meeting of the Ithaca section of the American Society of Civil Engineers held March 24, B. D. Tallamy of the New York Department of Public Works discussed problems encountered in planning the New York State Thruway. Tallamy is deputy superintendent of New York State Department of Public Works.

## New Courses

Short courses in the use of aerial photography for surveying the topography in highway construction and in the solution of highway traffic problems have recently been added to the curriculum of the School of Civil Engineering here at Cornell.

Professor T. D. Lewis is directing the courses in traffic engineering, which are designed to train men to plan the solutions of such problems as congestion, lack of adequate parking facilities, and so forth Much of the congestion existing at present in the large cities of America is, according to Professor Lewis,

*(More news on page 34)*

# Out of Phase

By HERBERT F. SPIRER, EP '51

## Spring Tension

Vladmir Sitzfleisch, valedictorian of Sibley, looked unusually sad. His slide rule was neatly tucked over his left ear, but the copy of *Eminent Victorians* in his buttonhole was wilting. He wore a dull-looking grey cast iron gear blank around his neck to ward off evil spirits.

"Why the mourning clothes, Tovarich?" I asked.

"I am as confused as the art student hunting for the lavatory in Franklin. I have run head on into *the* insoluble problem. Even Prof. Hurwitz will be stumped."

Sitzfleisch picked at his gold teeth with an inside calipers. He carefully burnt the fingerprints off his thumb and forefinger with a Bunsen burner and said,

"Rodney, you know very well that if you square a negative number you will get a positive number. Now if you cube a negative number, you get a negative number. Check! Now what happens when you raise a negative number to the two and one-half power?"

"You don't know, do you?" he shouted, leering triumphantly and thrusting an accusing gap lathe in my face. He was right. I didn't know the answer. Sitzfleisch was not the type to let a moment of success pass by. He munched loudly on a Johansson block, and murmured.

"I guess my pen will have to go on itching."

"Why?" I queried innocently.

"Because I have no scratch paper!"

This hurt, and I flamed up in anger. While I was flaming, he lit a reefer and took a deep drag. He exhaled and a transit and two surveyors standing nearby melted into a small lump. He laughed shrilly. and scurried away towards Sibley, leaping from tree to tree. Occasionally he would pause and hang by his tail, trimming his fingernails with a universal milling machine. All was peaceful on the campus, and the strains of the termite's nightmare song, *I Dreamt I Dwelt in Marble Halls,* resounded through ivy-covered corridors.

* * *

She laid a pale and still white form
  Beside the others there,
And then her anguished, piercing
    shrieks
  Rang through the silent air.
With still another mournful wail
  She turned upon one leg.
Tomorrow she'll come back again
  And lay another egg.

*—Harvard Engineer*

**Mr. Maret to Prof. Grantham: "I know E=IR, but where is the light switch?"**

Definitions, according to the Physics Department, are the acorns from which great scientific oaks grow. Screwdriver engineers will recognize the great need for working definitions, not to be found in the great textbooks, that may be applied to practical situations. After years of research I have finally accumulated enough of the practical definitions of engineering terms to offer to you several of these working definitions:

Amorphous—The Greek god of dreams.

Barium—What you do to dead people.

Binary—Small yellow bird noted for its singing ability.

Carbon—A storage place for street cars.

Catalyst—Western ranch owner.

Centimeter — A hundred-legged worm-like animal.

Chlorine—A dancer in a night club.

Cyclotron—A four-wheeled bicycle.

Hooke—The man who invented a barbed device for catching fish which was then named after him.

Torque—To speak to someone.

* * *

*The Rod and Sunshade*

Howie ("Ensign") Golub, now a self-made instructor in Route Surveying, was once a student like the rest of us. Way back in the old days, when trolleys ran on State Street, he was asked,

"Why is asbestos put on steam pipes?"

"The asbestos on those pipes," he replied snappily, "is—is to kind of ease the shock when you bump your head."

* * *

*Personal Item*

John Gerling and Robert Sims, recently of the Dean's List, have just been released from the infirmary after extensive treatment and cure. They were suffering from the Cornell engineer's occupational disease, overdose of No-Doze.

Ronald Wilcox is now known by his friends as "Doublebarreled" Ron. He was the first man to discover that you can copy a drawing twice as fast by carrying a pair of dividers in each hand and transfering two measurements at once.

Recent Developments
In Engineering

# Techni-Briefs

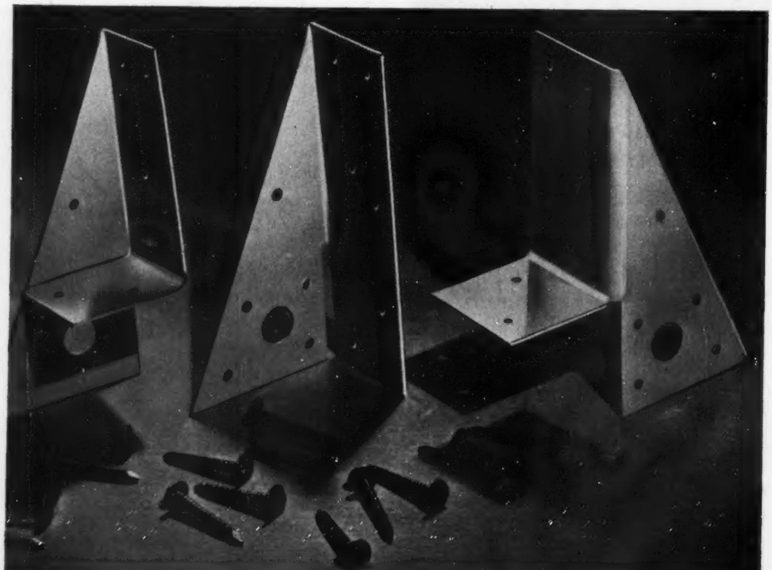
**Electronic Cleaning**

Electronic bombardment, a new method of cleaning optical glass surfaces prior to coating, has been developed by Bausch and Lomb, Rochester, N. Y. The process was designed primarily for aiding application of aluminum, the reflecting agent, to television and other first precision mirrors.

The ground and polished optical glass is placed in a metal holder in a high vacuum bell, where a tungsten filament is electrically heated to a temperature at which electrons are emitted. The electrons are attracted by the holder which is at a high positive voltage with respect to the filament. Thus attracted, the electrons bombard the glass at a speed of several thousand miles a second, leaving the surface entirely free of water and extraneous material.

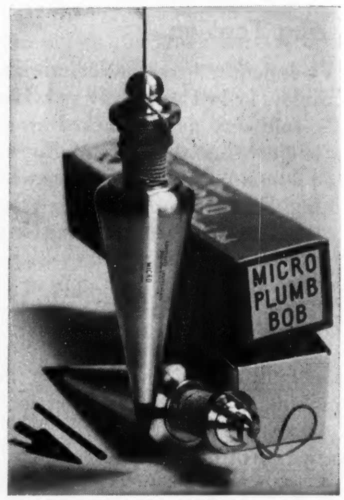
**New Framing Anchor**

A new timber connector, shown in the accompanying picture, is used to help eliminate bulky joints and connections with wood. Known as Trip-L-Grip framing anchors, the devices have been specified in home and other light construction work to increase rigidity around window and door openings, and in joining joists to beams, studs to sills, rafters to plates, etc.



**Better Plumb Bob**

This plumb bob (see picture), has a rotatable reel and special hook on the top of the neck. The cord is reeled off to approximate length wanted, then slipped into the hook which holds the bob exactly centered anywhere on the cord. The bob can then be minutely adjusted up and down, simply by rotating the spool.




The Micro Plumb Bob developed by Suverkrop Instruments.

**Carbide Parts Easy to Attach**

A new development by Carboloy Company, Inc., Detroit, now makes it possible to mount or attach carbide parts with screws, studs, etc., in a manner and with the same ease as similar parts made of softer metals.

The development is particularly effective where large sections of carbides are to be used. Heretofore, use of large sections has been handicapped to some extent by the fact that, in the hardened state, carbides are unmachinable to all practical purposes and cannot be drilled or tapped. This objection has been overcome by processes through which machineable materials are solidly imbedded in the carbide parts wherever the part is to be threaded.

When it is desired to attach carbides by means of studs, screws, etc., the approximate location of the point or points of attachment and the number of such points are first determined. The carbide part is then provided with machineable "inserts" in those locations. The part may then be drilled and tapped at those points either before shipment or by the user "on the job."

**Decimals vs. Fractions**

A survey by the Society of Automotive Engineers reveals that 76% of the aeronautical industry has considered the use of decimal dimensioning, that 63% already uses it, and that the rest use it for some purposes. In addition to the obvious advantage of eliminating error producing fraction-decimal-fraction operations, tolerances may be indicated merely by indicating digits after the decimal point.

# *Alumni News*

**Edward F. Entwisle, M.E. '06,** died at his home in Buffalo on March 8. Mr. Entwisle was general manager of the Bethlehem Steel Company's Lackawanna plant, and had served in the steel industry for forty years.

**Edgar H. Dix, Jr., M.E. '14, M.M.E. '16,** received the Francis J. Clamer Medal of the Franklin Institute at the Annual Medal Day ceremonies of the Institute in Philadelphia, April 16. Mr. Dix, director of metallurgical research and assistant director of research for the Aluminum Company of America at New Kensington, Pa., is being honored for his development of extra-strong non-corrosive aluminum products. One of Mr. Dix's major contributions to the field of metallurgy which warranted this award, was the invention of "Alclad," a material which combines the high resistance to corrosion of pure aluminum with the high strength of aluminum alloys. Alclad is used in the construction of most airplanes made in the United States.

**William D. Van Arnam, Chem.E. '16,** was inducted on April 15 into the Quarter Century Club of the Johns-Manville Corporation in recognition of his 25 years of service to the company. Mr. Van Arnam, at present sales manager of the Celite division of Johns-Mansville, started with the company as a salesman in 1922. In addition to his sales engineering work, he is prominent in the dry-cleaning industry, having served two years as president of the Laundry and Cleaners Allied Trades Association. Mr. Van Arnam's youngest son, Frederic, is at present attending Cornell.

**Ralph Bown, Ph.D. '17,** gave a talk on "Microwaves" before the Cornell Society of Engineers March 25. Dr. Bown has been prominent in communication research for many years, and since June 1946 has been Director of Research of Bell Telephone Laboratories. During the recent war he was a division member and consultant of the National Defense Research Committee, specializing in Radar.

**Harold D. Craft, A.B. '31, C.E. '32,** is now the executive assistant to the divisional vice-president for the Interchemical Corporation, Bound Brook Division, Bound Brook, Ne wJersey. During this past war, Craft served as company commander in the 36th Infantry Division and was taken prisoner in the early days of the Italian campaign just after the invasion at Salerno. Following his release from prison camp by the victorious allied troops, he was discharged as a major in December, 1945, at which time he went to work for Interchemical.

*—Courtesy Cornell Alumni News*

**Winton I. Patnode**

Dr. **Winton I. Patnode, Ph.D. '31,** recently took charge of the Hanford Engineering Works of General Electric at Richland, Washington. The Hanford works, taken over last fall by General Electric, is engaged at present in the development of atomic energy for peacetime uses. During the war, it was one of the two major plants in the U. S. working on the utilization of atomic energy for military purposes, the Clinton Engineering Works of Oak Ridge, Tennessee, also being active in that field. Dr. Patnode, as director, succeeds Dr. W. D. Coolidge.

**Dr. Albert Rose, E.E. '31, Ph.D. '35,** was announced recently as the recipient of the Morris Liebmann Memorial Prize for 1943 for his outstanding work on television research. The award was presented of the Research Laboratory of to Dr. Rose, a member of the staff R.C.A., by the Institute of Radio Engineers at their annual banquet held March 5 at the Hotel Commodore in New York City.

**Allan R. Greene, M.E. '32,** is employed at present as chief engineer, Manufacturing Department, Cities Service Oil Company, of New York City. Mr. Greene served four years as an officer in the past war, finally attaining the rank of lieutenant colonel while holding the position of staff officer with the 36th and 100th Infantry Divisions in France. Before going into thearmed services, he was a test engineer with the Atlantic Refining Company of Philadelphia. Mr. Greene now lives at 712 Garden St., Plainfield, New Jersey.

**Robert E. Patrick, M.E. '32,** is now employed with the Taber Associates Company of Philadelphia, which specializes in engineering customer contact, business administration and other problems which have to do with administrative engineering. As an executive of the company, Mr. Patrick is responsible for administration and sales work. Before accepting this position, he worked with the Kellet Aircraft Corporation of North Wales, Pennsylvania.

**G. Herbert Stelljes, M.E. '32,** is now assistant controller for the Wright Aeronautical Corporation of Wood Ridge, New Jersey. Mr. Stelljes has been employed by Wright since 1933, working up through the company to the position of budget director in 1942 and then finally to his present

*(More news on page 36)*

# Cornell Society of Engineers

107 EAST 48TH STREET 1946-1947 NEW YORK 17, N. Y.



*"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."*

**Robert B. Lea**

## *President's Message*

This year we set as one objective the forming of one or two more regional sections of your Society. After several discussions with Dean Hollister and numerous alumni it was felt that Cleveland and Detroit, with strong alumni groups, would be the best places to start. I was able to prevail upon Tell Berna '12 to undertake the job as chairman of a special committee on expansion. Cooperating in Detroit with capable Walker Cisler '22, arrangements were completed for organization meetings on successive nights, which was most convenient for several of us who were to attend from out of town.

On the plane to Detroit I found, appropriately, that the pilot, a former student at Ithaca, was a grandnephew of Ezra Cornell.

In Detroit, Walker Cisler arranged for the Cornell Club of Michigan to act as host. A large number of alumni, several with sons hopeful of becoming Cornellians, turned out to meet and hear for the first time W. Julian King, the new Director of Sibley College. Phil Kent '14, president of the Club, opened the meeting with an interesting report of his experiences as an observer of the Army cold weather tests in Alaska. Tell Berna gave one of his usually humorous but provocative talks, and your president brought greetings from the Society.

All were much impressed with Director King's description of the present-day Sibley with its advances and many postwar problems. I am happy to report that after the meeting a committee reported favorably on forming a regional group, and Linton Hart '14 has been named chairman. He therefore becomes our regional vice president for Michigan. He will work within the structure of the Cornell Club of Michigan as chairman of the Committee on Engineering Activities, which will be given the functon of running one meeting a year devoted entirely to engineering matters. Lint is past president of the Club, a very active Cornellian, and I know will do a splendid job.

In Cleveland the next evening an equally large group of alumni turned out for Engineers Night. Tell Berna acted effectively as toastmaster. Dr. Gustav Egloff came from Chicago an daddressed the group on "Petroleum in the Modern World." His wide travels and technical knowledge enabled him to give a most enlightening discussion on this vital subject.

Director King's talk again made an excellent impression. After dinner he was kept nearly an hour in informal discussions with various alumni who were happy to meet him. The Cleveland group elected the following Executive Committee:

George C. Brainard, Chairman
S. K. Wellman
Harold Kneen
John R. Dingle
S. Everett Hunkin

George C. Brainard thus becomes our regional vice president for Cleveland.

Thus your Society will have more channels through which it can promote the welfare of the College of Engineering through direct contact between faculty and the alumni groups. This is indeed fortunate when institutions like Cornell are confronted with so many problems in this unsettled period.

I hope you will support the Society in playing an increasing part in the welfare of the college. I know it can if you all give such loyal support as I have received during my year as your president.

ROBERT B. LEA

# Book Review

*THE ELECTRONIC THEORY OF ACIDS AND BASES. W. F. Luder and Saverio Zuffanti. ix + 165 pages. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1946. $3.*

The structures and reactions of acids and bases have been topics for speculation and research since the earliest days of chemistry. The overwhelming importance of aqueous solutions, as well as the lack of information and understanding about non-aqueous systems, certainly has been the main factor contributing to the development of the older approach to acids and bases, such as the hydrogen ion-hydroxyl ion concept or the Bronsted-Lowry Theory. In 1923 G. N. Lewis proposed a general theory of chemical reaction of far reaching significance. He made the assumption that the formation of the most stable electronic configuration in molecules or ions is the controlling factor in determining what reaction will occur spontaneously, and showed how this can be applied to acid-base reactions as well as many others. Unfortunately this theory was neglected until about 1938.

In the *Electronic Theory of Acids and Bases* the authors describe the Lewis Theory and consider its application to numerous systems. They contend that all other theories of acid-base behavior which have been proposed can be described completely in terms of the unifying concepts of the Electronic Theory. "Searching for the property common to all acids, or that common to all bases, Lewis concluded that acids and bases correspond respectively to what Sidgwick later called acceptor and donor molecules. Neutralization is the formation of the coordinate covalent bond between the acid and base." Following an historical introduction and a chapter devoted to "Atomic Orbitals and Valence" in which modern views about forces holding atoms together in molecules and ions are set forth in quite elementary albeit incomplete fashion, the authors discuss "The Electronic Theory of Acids and Bases," "Electrophilic

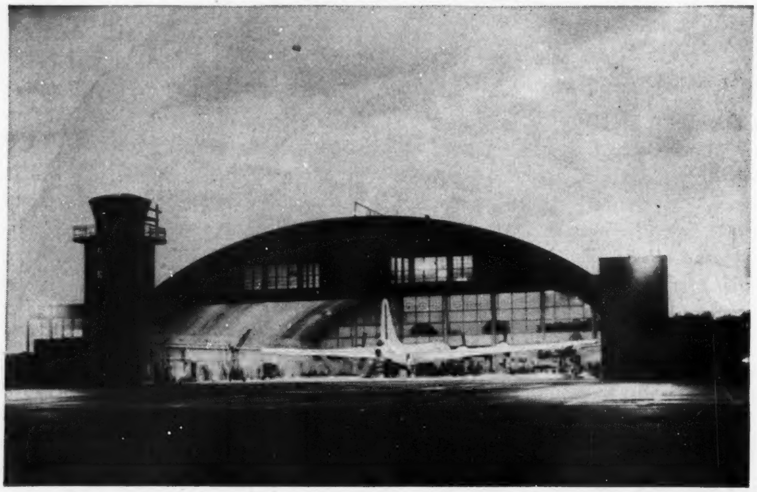
and Electrodotic Reagents," and "Acidic and Basic Radicals" in separate chapters. Then follow four chapters devoted successively to the four criteria of acid-base behavior selected by Lewis as fundamental; namely, "Neutralization," "Titration with Indicators," "Displacement," and "Catalysis." The three final chapters are devoted to more specific discussion of catalysis with particular reference to organic chemistry and should be of considerable interest to the organic chemist and the engineer.

This reviewer feels that the Lewis Theory is a magnificent contribution and stands as a tribute to the genius of the late G. N. Lewis. However, he can not help but wish that some other name had been chosen to describe many of the reactions now being labeled acid-base reactions. For example, the authors of this book show how the Lewis Theory can be used in explaining oxidation-reduction phenomena and they imply, at least, that oxidation-reduction reactions are a type of acid-base reactions. This reviewer feels that to classify practically every reaction as an acid-base reaction is unnecessarily confusing.

**Noteworthy Emphasis**

The placing of emphasis by the authors on the relative nature and strength of acids and bases is a noteworthy point. In their "Conclusion" they state, "Much remains to be done in the way of quantitative measurement as suggested by this new relativity in chemistry. No doubt, as more and more experimental results accumulate, the theory will undergo modification and refinement. Eventually it may give way entirely to another, but the least that can be said for it now is that it can rid chemistry forever of one-element theories of the behavior of matter." With this there can be no quarrel. One can only hope that eventually it will not be necessary to force facts tortuously into a particular pattern. *The Electronic Theory of Acids and Bases* is certainly a timely exposition of an important concept of chemistry and should serve to stimulate discussion and research.

*E. R. Van Artsdalen*
*Asst. Prof. Chemistry*



A night view of the newly-completed General Electric Flight Test Center at Schenectady County Airport.

## Flight Testing

(*Continued from page* 8)

Added to the expense are the man-hours spent on the calculations and plotting of performance curves and analysis of the data obtained. In order to get extensive data under rapidly changing conditions, a set-up is often used whereby a camera takes photographs of an instrument panel. Shots can be taken as rapidly as 10 frames/second. When the film is developed, the instruments can be read as slowly as the reader desires, and accurate curves of temperatures, pressures, velocities, etc., can be plotted. An automatic temperature recorder can be used and the data related directly to the photographic data. Several hundred temperatures can be read in a few minutes on such a recorder.

The possibilities of flight testing are extensive. In 1942, the General Electric Company organized a flight test program. The first plane was a B-23, which was modified for testing turbosuperchargers. Since then, the Fight Test Division has operated three B-29's and six B-24's and has really come into its own. Starting at LaGuardia Field in New York, it was found necessary to move in a year to another place with more facilities—Brownsville, Texas. In 1945, however, operations were found to be so successful, that arrangements were made to continue the important work at Schenectady, New York, a site nearer a major G.E. factory than the previous bases. Realizing the importance of this work, the Company constructed a modern Flight Test Center at the Schenectady County Airport. This building (160 feet by 175 feet) can accommodate two B-29's or four B-24's. Shop space, engineering offices, and laboratory rooms are included in a two-story lean-to along the south side of the hangar.

### "Flying Laboratories"

The planes which are used for testing are called "flying laboratories." At the moment, the Fight Test Division is busy testing an axial flow jet engine in a B-29 flying test bed. An electronic carburetor air-pressure regulator has been installed in one of the B-24's for test purposes. A C-45 houses an electronic automatic pilot, and work has recently been done on testing radar equipment in a B-24. During the past, tests were run on gun turret and fire control system operation, turbo-pressurized cabins, and turbo-supercharger operation. No one knows what the future will bring.

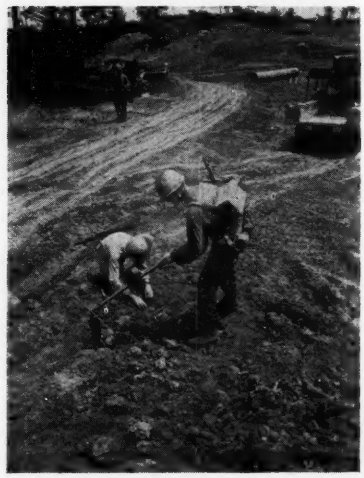
In his article in the April issue, the title of Mr. Maynard M. Boring was misstated. His correct title in the General Electric Company is Assistant to the Vice-President in Charge of Engineering Policy.

## Okinawa Road

(*Continued from page* 13)

that the roadway now had an excellent drainage system.

Now the men who had been using their shovels to drain the roads, could take up a less physically tiring job. Demolition work became the order of the day, with the new Composition "C" being the most used explosive. Composition "C" is the putty-like explosive that has

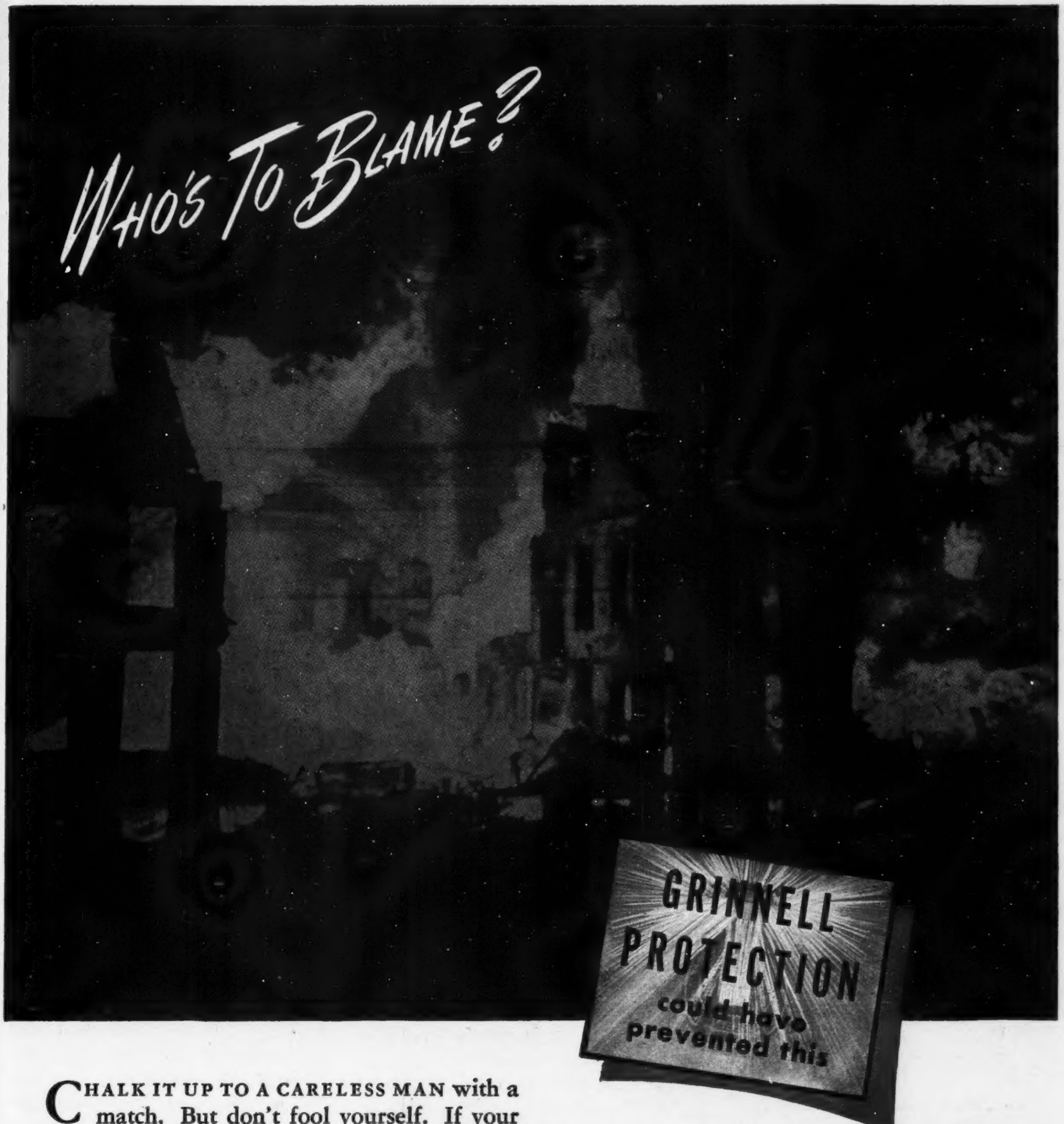


Latest type mine detectors were sometimes used to locate Jap mines on the roadway.

the advantage over other types in that it can be packed into any size hole or pushed into any desired shape. This work entailed blowing up any bed rock that projected too far above the surface of the ground, breaking up the coral in the pits so that the power shovels could load the trucks and blasting down a 70 foot coral cliff that obstructed the roadway. This cliff had been one of the most embattled points in the whole area for it controlled the approach to Shuri. A common occurrence in blasting at this point was the revealing of the remains of the Jap works in the hill, with part of their equipment still inside. For this blasting compressor trucks were at last used to furnish the compressed air necessary to operate air drills. The drills were used to make holes in which the Composition "C" was placed before it was set off by primacord.

In contrast with the work on

(*Continued on page* 28)




CHALK IT UP TO A CARELESS MAN with a match. But don't fool yourself. If your properties suffer material damage by fire the truly careless man will be *you*—for as long as people are human and thoughtless, fires will start, but as long as there is Grinnell Protection you can control these fires quickly, effectively, at the source.

So the choice is actually your own—whether you risk your property to swell the present $500,000,000 annual destruction by fire—or whether you safely join the group of those owning over seventy billion dollars worth of property who have prepared for fire, who have cut losses to trifling amounts with Grinnell Protection.

There is a system of Grinnell Protection for every kind of fire hazard, ready to stop fire immediately wherever it strikes. If your property is unprotected against fire you're *paying* for Grinnell Protection—*why not have it?* Grinnell Company, Inc., Providence 1, R. I. Branch Offices in Principal Cities.

**GRINNELL**

*Automatic Fire Protection Systems*

## Okinawa Road

(*Continued from page* 26)

Leyte Island, few bridges were needed on Okinawa. If we had any break during our time here, it was the relief from the time consuming bridge jobs. But we had to replace one Bailey Bridge with a permanent wooden structure so that we could use this Bailey Bridge in the town of Shuri. During the construction, traffic had to use the prefabricated bridge. No new bridge location could be used, for cliffs blocked all the crossings in that area. So the framing for the wooden bridge was built directly underneath the steel structure. The road was closed for only one night while the Bailey Bridge was taken down and planking was laid to surface the new one. Quite a bit of publicity was given to this job, for it was one of the few times we had built one bridge one foo tunder another.

**A bulldozer with carryall attached is starting to dig a drainage ditch for the highway in the background. Without these carryalls, proper ditching could not have been made.**

At last one could see some real progress on the road. The sun, which now took the place of the rain, shone down on a gleaming white strip that was Route 4. Vehicles were able to travel down the road at their maximum speed, necessitating the use of MPs to keep them at a normal rate. Just a few more finishing touches were needed to make it a first class highway. But it was the middle of June (the battle formally ended on June 5) and the Division was leaving the island. Thus the men who built up this section of roadway from a mud trail to a speed highway were never able to see their task through to the end. It seems as if it was the fate of the combat engineers to never completely finish any assigned job.


*Television gives you a choice seat at the game.*

# *Television—a Season Pass to Baseball !*

Every home game—day or night—played by the New York Giants, Yankees and Brooklyn Dodgers will be seen over television this season!

Owning a television receiver in the New York area will be like having a season pass for *all three ball clubs.* And in other cities, preparations for the future telecasting of baseball are being made.

When more than one home game is on the air, baseball fans can switch from one to the other—see the most exciting moments of each through television!

Those who own RCA Victor television receivers will enjoy *brighter, clearer, steadier* pictures through the RCA Victor Eye-Witness picture synchonizer that "locks" the receiver in tune with the sending station.

To witness baseball or any other event in the ever-growing range of television programs—you'll want the receiver that bears the most famous name in television today—RCA Victor.

When you buy an RCA Victor television receiver or radio, or Victrola radio-phonograph, or an RCA Victor record or a radio tube, you know you are getting one of the finest products of its kind science has achieved.

*Radio Corporation of America, RCA Building, Radio City, New York 20. Listen to the RCA Victor Show, Sundays, 2 p.m., Eastern Daylight Time, NBC Network.* "Victrola" T.M. Reg. U.S. Pat. Off.

**Continue your education with pay—at RCA**

**Graduate Electrical Engineers:** RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loud-speakers, capacitors.
- Development and design of new recording and reproducing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

*Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.*

**Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

RCA

**RADIO CORPORATION of AMERICA**

## Highway Safety

(*Continued from page* 11)

in the form of prepared acts are:

1. Uniform motor vehicle registration, certificates of title, etc.
2. Uniform operators' and chauffers' licenses.
3. Uniform motor vehicle liability.
4. Uniform motor vehicle safety responsibility.
5. Uniform traffic regulations on highways.

It is not necessary to go into detail to see how far reaching these proposals can be. In full, the acts would make it possible for a driver in one state to drive in any state, and for trucks which are under one maximum size and weight limit to travel in any state. The acts would provide for standard highway signs and uniform regulations regarding left turns, passing, etc.

One important fact to be stressed is that these acts are not proposed federal acts, but are state acts, and rather than increase federal control over highway traffic, will remove any causes for federal control.

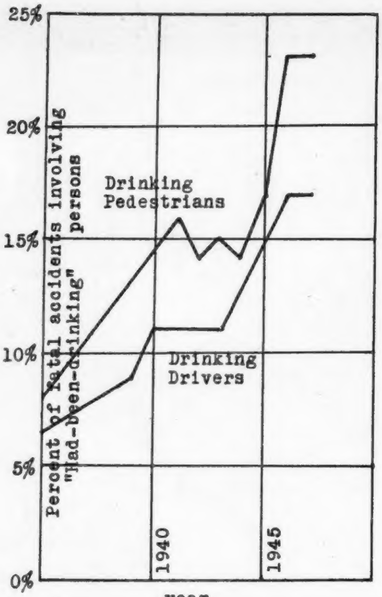



Chart 3
**Drinking an Auto Accidents**

### Present State Action

At the present time thirty states have adopted in close uniformity, one or more acts of the *Uniform Motor Vehicle Code,* but no state has adopted them all. Uniform traffic laws have lagged behind furthest in the six New England states as a group.

Not all present legislation is towards uniformity, however, as hundreds of non-uniform vehicle bills are pending in state legislatures. Non-conformity is particularly evident in proposed legislation related to speed limits, drunken driving penalties, financial responsibility, compulsory inspection, equipment, school bus regulations, and accident reporting. But if these laws are all directed toward safety and convenience, they shouldn't be rejected on grounds of irregularity alone, for it is senseless to standardize safety merely for the sake of standardization.

When one city gives cars moving from a parking lane to the outside driving lane the right-of-way over through traffic, and another city gives the reverse, accidents are bound to happen. When one state places 25-mile limits on curves

(*Continued on page* 32)

## Highway Safety

(*Continued from page* 30)

which can be taken with ease at 40, the states which adhere to strict limits are handicapped.

The subject of uniform traffic laws is becoming a popular topic throughout the country. Nearly all experts agree on its benefits to safety; most agree that it is to be desired on its own merits.

### Drunken Driver

The last case needed to be mentioned is that of the drunken driver. See Chart 3 for positive evidence of his role in boosting the accident rate.

A person who has been drinking is not a competent driver and should not be permitted to drive any vehicle under any circumstances; this is the almost unanimous opinion of safety and other highway officials. At the present time the best way to keep the drunken driver off the road is to pass and enforce strict ordinances.

Undoubtedly a moderate cooling off period behind bars, without bond or appeal, for all drunken drivers would effect a sharp decrease in traffic deaths. Officials from every section of the country have recommended this, but because of the politics involved, are afraid to carry the proposals much further. The uniform traffic code will help, but it is necessary for all citizens to back the effort to put a stop to drunken driving, which is both a *fundamental* and *contributing factor* to accidents.

### Wets vs. Drys? No!

This is not a case of the prohibitionists against the anti-prohibitionists camp, for when drunken driving is stopped, the drys will have lost (or solved) half of their case for prohibition. This author believes that drunken driving is a crime against the state, as is hit-and-run driving. When upwards of 10% of all "accidental" deaths are caused by the drunken driver, citizens cannot sit back and wait for action. Misjudgment is human error and should be corrected when possible, but drunken driving is a crime and should be stopped as completely and effectively as possible.

### Evaluation

Highway safety can and should be accomplished economically and efficiently. Such items as uniform traffic laws, elimination of minor hazards, good road signs, lane stripes, one-way streets, special attention at RR crossings, and strict enforcement of laws regarding the drunken driver don't cost us very much, and the returns are most certainly more than worthwhile.

The most important safety hazards are still carelessness and thoughtlessness. Only through individual efforts prompted by safety campaigns can these major causes be minimized.

---

* Governor Peterson of Nebraska.

* Quoted from *Highway Builder*, March, 1947.

Special credit is due to the Eastern Railroad Presidents Conference; the *World Almanac,* published by the New York World-Telegram; the various publications of the National Highway Users Conference; the *Clipsheet* of the Board of Temperance of the Methodist Church; and other circulars and news releases from which the data for graphs and writing were obtained.

## College News

(*Continued from page* 18)

unnecessary and may be partially if not wholly alleviated by the proper analysis of conditions.

### Knox Appointed

Roger C. Knox, former materials engineer in the Radiation Laboratory of the University of California, and personnel supervisor of the Tennessee Eastman Corporation at Oak Ridge, Tennessee, has been appointed assistant to the director of the Laboratory of Nuclear Studies. Knox attended the University of California during 1929-32, enrolled in the College of Commerce.

### Training Program

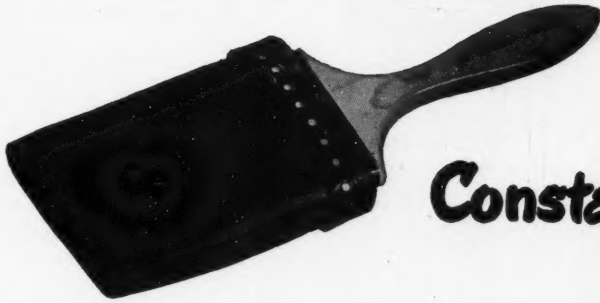
The Chance Vought Aircraft Division of the United Aircraft Corporation, Stratford, Conn., announced earlier this spring that it intended to re-establish its Engineering Training Program with a group of 50 men selected from the graduating classes of 55 leading engineering colleges throughout the nation.

### Conventions

Dr. Hans Bethe of the Department of Physics at Cornell, spoke on the subject, "Is International Control of Atomic Energy Technically Possible?" at the second afternoon meeting of an all-day conference on "Atomic Energy and Disarmament" at Colgate Inn, Hamilton, N. Y., on Saturday, March 29. Topics covered at the conference, which featured scientists and authorities of national reputation, included "The Challenge of Atomic Energy to our Communities," "The Meaning of the Atomic Age," "Domestic Regulation and Peace Time Applications of Atomic Energy," and "Can We Preserve Our Freedom in the Atomic Age?"

At the Seventh Massachusetts Institute of Technology Conference on Physical Electronics held from March 27-29, at M.I.T., Professor Lloyd P. Smith, of the Department of Physics at Cornell, was chairman of a conference on Thermionic Emission Problems. The Electronic Problems of Solids and Gas Discharge Phenomena were other subjects included in the conference.

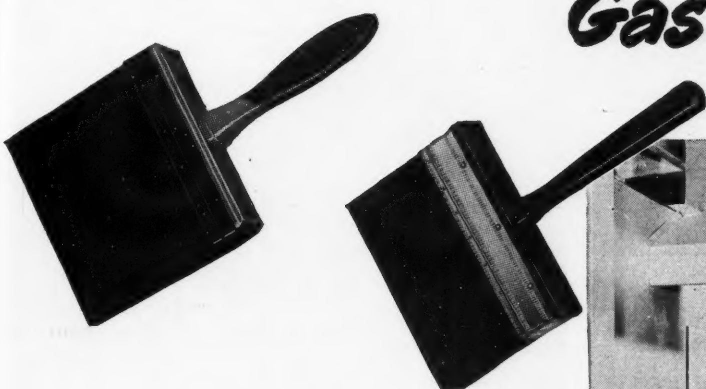
(*Continued on page* 36)

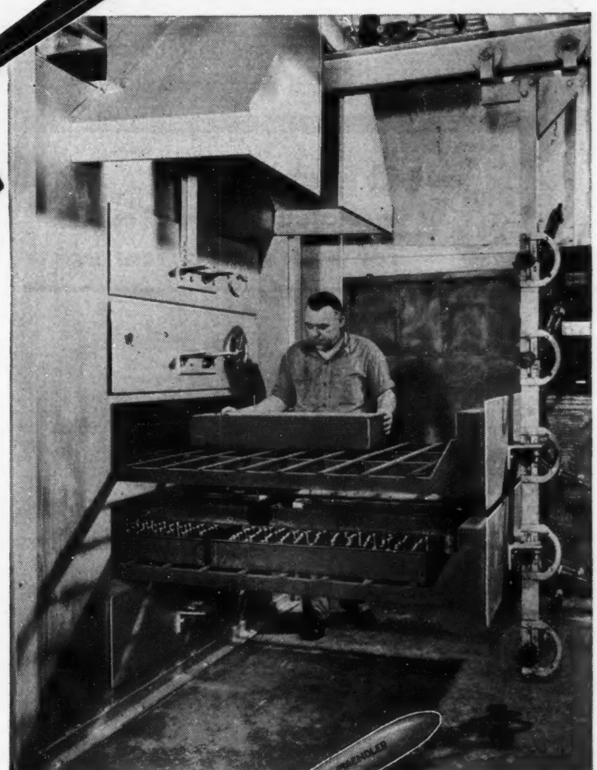


# Constant High Quality

## with Uniform

## Gas heating







Uniform heat, at precise temperatures, assures the constant high quality of Maendler paint brushes. Three automatic, clock-controlled vulcanizing ovens guarantee the exact time-temperature relationship for sealing set-in-rubber bristles; GAS, dependable heat source for toughest industrial heating problems, insures uniform oven temperatures.

The controllability of GAS proved an asset to production at the Maendler plant. By charging the ovens at the end of the normal working day, one extra vulcanizing cycle can be completed after-hours . . . with automatic time and safety controls substituting for the operator.

Efficiency of Gas-Fired Equipment, and economy of GAS for industrial heating, have been demonstrated in thousands of applications as unusual and interesting as this vulcanizing process.

*Photo by* DESPATCH OVEN COMPANY
*Minneapolis, Minnesota*

*Brushes by* MAENDLER BRUSH MANUFACTURING COMPANY, INC., *St. Paul, Minnesota*

**MORE AND MORE...**

**THE TREND IS TO GAS**

**FOR ALL INDUSTRIAL HEATING**

# AMERICAN GAS ASSOCIATION

420 LEXINGTON AVE., NEW YORK 17, N. Y.

## College News

(*Continued from page* 34)

Professor J. N. Goodier, Head of the Departments of Mechanics and Machine Design in the School of Mechanical Engineering, gave a lecture on "The Torsion Problem in Elastic Stability" at the Harvard Applied Science Colloquium on March 19.

Professor W. J. King, Director of the School of Mechanical Engineering, spoke at and attended an engineering forum at the convention of the Oil-Heat Institute held on March 25 and 26 at Atlantic City. Professor King also spoke at the Cornell Club of Michigan on March 12, the Cornell Society of Engineers in Cleveland on March 13, the Cornell Club Luncheon in Rochester on March 19, and attended the conference of the Institute of Aeronautical Sciences in Cleveland on March 28. While attending the Midwest Power Conference in Chicago on April 1 and 2, Professor King attended meetings of the Power Test Code Committee No. 22 and the Gas Turbine Co-ordinating Committee of the A.S.M.E.

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## Alumni News

(*Continued from page* 21)

assistant controllership. While at Cornell, he was a member of Kappa Delta Rho, the freshman crew squad, and the varsity lacrosse team. At present, Mr. Stelljes lives at 1176 Stasia St., Teaneck, New Jersey.

**John L. Trask, C.E. '32, M.C.E. '33,** is at present serving as branch manager of the Elliot Addressing Machine Company in Cleveland. Before his two years with the Navy in Washington, Mr. Trask held the position of branch manager of Elliot in St. Louis.

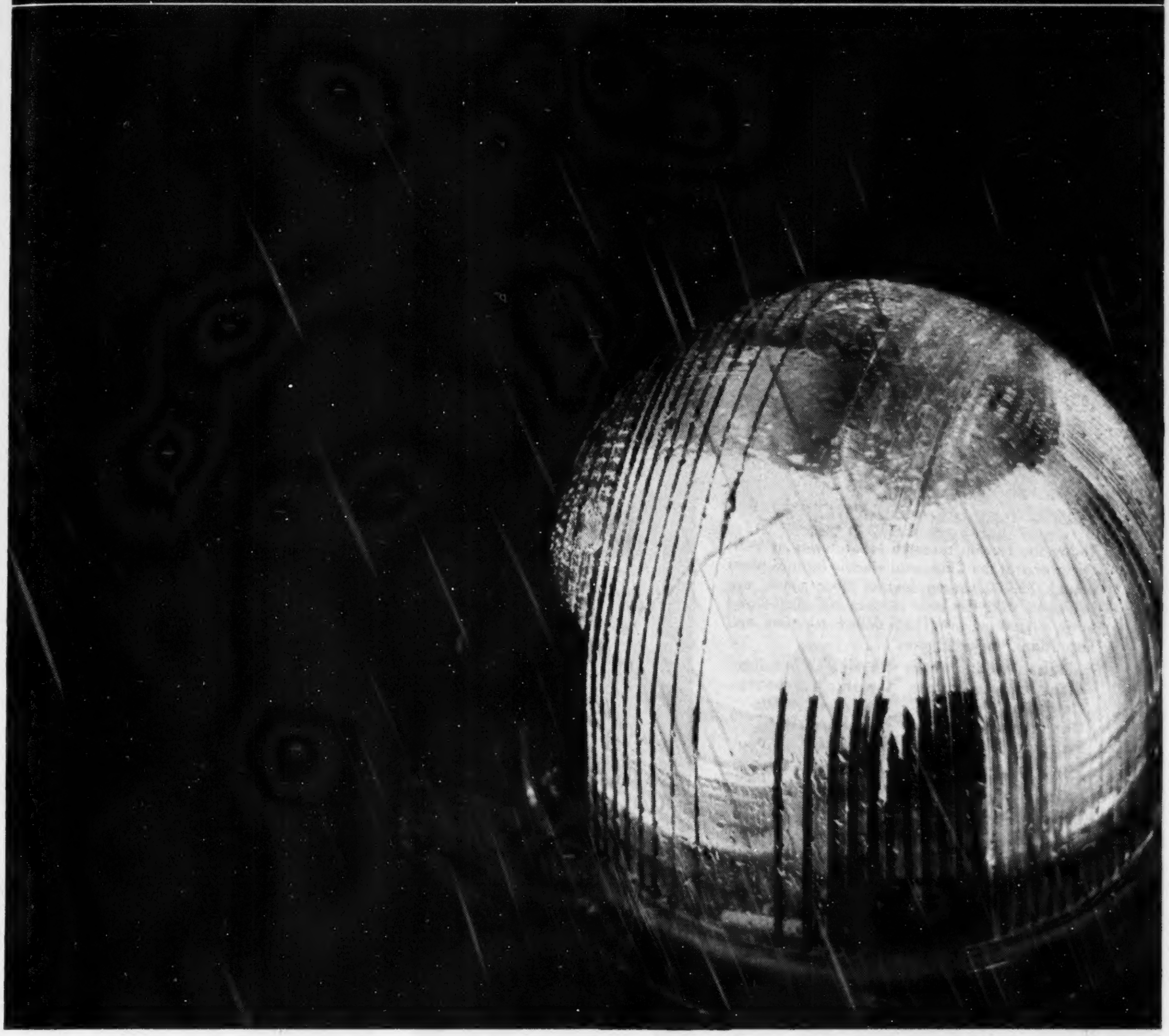
**Marvin M. Wilkinson, M.E. '32,** is now vice president of the Ohio Citizens Trust Co., of Toledo, Ohio. During the war Mr. Wilkinson served as vice president and general manager of the Toledo Ship Building Company, Incorporated, of Toledo.

**John L. Patterson, Ch.E. '35,** has recently been appointed superintendent of the Chemical Division of the Clinton Engineering Works at Oak Ridge, Tennessee. During the war, Mr. Patterson worked with the government at Oak Ridge on the Manhattan Project, his address for this period, "General Delivery, Oak Ridge" telling the story well by itself.

**Franklin S. Macomber, B.S. in A.E. '37,** at present holds the position of budget administrator of the Consolidated Vultee Aircraft Corporation, Stinson Division, Wayne, Michigan, and is doing additional consulting work in management engineering on the side. After his graduation from Cornell, Macomber went to work on time-study for the Owens-Illinois Glass Company of Columbus, Ohio, being transferred to the Bridgeton, New Jersey, plant in 1939. Following

(*Continued on page* 38)

# The lamps that split "pea soup"...



"ATTENTION, passengers! Fasten your seat belts, please!"

The stewardess stood calmly at the head of the cabin. "Because of adverse flight conditions, we are landing at Newark Airport instead of LaGuardia."

Up in the nose of the plane, the pilot squinted through heavy fog. Slowly he pushed the wheel forward and the plane headed down into the pea soup.

Then he saw them. Tiny pinpoints of clear light, glinting through the thick haze. He guided the plane down between the rows of lights and in a matter of seconds it was safely on the ground.

Flying in pea soup is never easy. But the worst part of it used to be landing in a blinding glare barrage caused by the runway markers lighting up the fog.

During the war a leading manufacturer of airport lighting asked Corning to help them design a new runway light that could penetrate any kind of weather without glare. The result was an intricate lamp globe which controls the beam so the pilot sees the light but not the halo.

Corning research has helped aviation in many other ways. Newark's big Bartow air beacon was made from five special glass lenses at Corning. "Black Light" lamps and housings that cause aircraft instrument panels to glow softly at night are all made of Corning glass, as are the little glass jewels in the instruments themselves. Wingtip lights and radio tubes are two more examples.

Altogether we have over 50,000 different glass formulae. Maybe one of them will come to your rescue when you're stewing over some problem in your new job. Make a note now to keep Corning in mind after graduation. Corning Glass Works, Corning, New York.

**CORNING**

*means*

**Research in Glass**

## Alumni News

(*Continued from page* 36)

this, he became chief industrial engineer for Vultee in 1942 and then executive assistant to the division manager in 1944. In his position now, he is executing the duties of budget administrator.

**Richard L. Pleuthner, M.E. '37,** is now working for the E. I. DuPont de Nemours and Company branch in Buffalo doing project engineering on air-conditioning problems. Mr. Pleuthner held the position of engineering officer for the 354th Fighter Group, USAAF, during this past war. An article published by him appearing in Food Industries dealt with the subject: "Maintaining High Humidities in Cold Storage."

**Robert K. Storey, E.E. '37,** at present holds the position of resident salesman for the Syracuse area for the Carnegie-Illinois Steel Corporation. Previous to that time, Mr. Storey worked as salesman for Carnegie at Buffalo.

**George W. Hobby, Ch.E '39,** recently attained the position of chief chemical engineer for the Sharples Chemicals Company of Wyandotte, Michigan.

**Burl Kimple, B.S. in Ch.E. '44,** who returned to Cornell in October to continue his studies toward his Ch.E. degree, withdrew recently to accept a position as assistant department head in the Fermentation Department of the Bristol-Myers Company in Syracuse.

## George Winter

(*Continued from page* 15)

the best of everything in scientific advancement, and because of a scarcity of materials, erected successfully many structures which would be a daring enterprise to an American engineer even today. While in Russia, he did a considerable amount of research in safe-guarding buildings against mining subsidals, and lectured for a time at the Mining Institute. His work was finished in 1938, and it was time to move on to the next stage of advancement.

A close friend at the University of Rochester urged him to come to this country, and, forseeing the

(*Continued on page* 40)

## George Winter

*(Continued from page 38)*

European struggle and wanting to bring up his child in decent surroundings, he came to Cornell as a research fellow and started his postgraduate study. At that time the American Iron and Steel Institute established a cooperative research project at Cornell to pioneer the use of light-gage steel in buildings. Professor Winter has been in charge of this project ever since his thesis, for the degree of Doctor of Philosophy in Engineering, was completed in June, 1940, whereupon he received his Ph.D. The thesis was not published until recently. It was submitted to the War Department, which immediately restricted and classified it, even though the country was still at peace. Thus his project, supported by the American Iron and Steel Institute, found timely application to the war effort. In 1943, the Institute, on Dr. Winter's recommendation, submitted additional specifications for steel structures to the War Department, and these were undoubtedly essential to the planning of special buildings and light-weight naval craft. Since the war, Professor Winter has investigated the applications of his research to peace-time construction, and his findings have resulted in the "Specifications in the Design of Light-Gage Steel Structural Members," issued by the American Iron and Steel Institute in April 1946. These specifications have since been incorporated into the building codes of many cities and at present are being considered by a group of four-hundred municipalities on the West Coast.

### Published Many Papers

After receiving his doctorate, Mr. Winter continued his investigations as a research associate until he was appointed an instructor in 1942. Shortly thereafter he was appointed Assistant Professor of Civil Engineering, and in June 1946, he was elevated to Associate Professor.

Dr. Winter has published more than a dozen papers. Among them "The Crushing Strength of Steel Webs" and "The Strength of Slender Beams," in the Proceedings of the American Society of Civil Engineers, one article in the Journal of the American Concrete Institute, and one in the CORNELL ENGINEER. He is an outstanding authority in the field of light-weight steel construction. In addition to his research work, Professor Winter is teaching courses in structural engineering, chiefly on an advanced graduate level. He is a member of the Society of Sigma Xi, Phi Kappa Phi, Chi Epsilon, the American Society of Civil Engineers, and the American Concrete Institute.

Civil Engineering is by no means the only interest of Professor Winter. He speaks four languages, plays the piano, and enjoys classical music and literature. His favorite active pastimes are winter sports, skiing and mountain climbing. On one occasion he helped to rescue two people from a snow slide, but before his party reached the scene of the disaster, three others had already died. He has taken an active part in the formulation of the policy of the schools of Cayuga Heights, where he and Mrs. Winter and their son, Peter M., reside.

# STRESS *and* STRAIN...

The Kentucky colonel always closed his eyes when he took a drink. When questioned concerning this habit he readily explained:

"The sight of good lickah, suh," he said, "always makes my mouth watah, suh; an' I do not like to dilute my drink, suh!"

* * *

*Professor of Economics: "You boys of today want to make too much money. Why, do you know what I was getting when I got married?"*

*Voice from rear: "No, and I'll bet you didn't either."*

* * *

"I'm a big gun at college."

"Then why don't I hear better reports?"

* * *

*Professor: "Wise men hesitate; fools are certain."*

*Student: "Are you sure?"*

*Professor: "I am certain."*

* * *

"Who was dat lady I saw you out wit last night?"

"That was no lady and I didn't outwit her."

* * *

*Definition: A rattlesnake—an eel with a crap game in the back room.*

* * *

One engineer to another: "Grab the end of that wire."

"All right."

"Feel anything?"

"No."

"Well then, don't touch the one next to it; it's got over 500 volts."

* * *

Microscopic lens doth show
Water teems with insects queer.
Ah, what a joy it is to know
The damn things can't exist in beer.

* * *

*"I can't diagnose your case. It must be drink."*

*"O.K. Doctor — I'll come back when you're sober."*

*Woman's philosophy: If the shoe fits, buy a size smaller.*

* * *

ME: "What is more beautiful to behold than a pretty girl?"

EP: "Such grammar! You mean to be held."

* * *

*Father: "After all, he's only a boy, and boys will sow their wild oats."*

*Mother: "I wouldn't mind if he didn't mix in so much rye."*

* * *

Love makes world go round; but then, so does a good swallow of tobacco juice.

* * *

We understand that one of the boys over in the EE department is trying to calculate what the speed of lightning would be if it didn't have to zig-zag.

* * *

Two herrings who were brothers walked into Jim's one day and proceeded to down one beer after the other. One of them became very boisterous and started to smash glasses and furniture. The other continued to drink quietly.

Jim, becoming very disturbed, leaned over the bar and asked the quiet herring, "Why don't you take care of your brother?"

The herring gave him a fishy stare and replied, "Am I my brother's kipper?"

* * *

*C.E.: "I asked her to kiss me without avail."*

*M.E.: "I don't like kissing through those things either."*

* * *

"Drink broke up my home."

"Couldn't you stop it?"

"Impossible! The darn still exploded."

* * *

A Swede walked into a saloon and asked for a shot of squirrel whiskey.

"I haven't any squirrel whiskey," said the bartender, "but I have some Old Crow."

"But," replied the Swede, "I don't wanta fly, I yust want to yump around a little."

* * *

A recession is a period in which you tighten up your belt.

A depression is a time in which you have no belt to tighten.

When you have no pants to hold up, it's a panic.

* * *

She: "Do you know what they have been saying about me."

He: "Why do you think I came over to see you."

* * *

A young lady was recently introduced to a tired, dejected ChemE we happen to know. Wishing to start him talking, she asked him what he was taking up this year. He cryptically answered, "Space, mostly."

* * *

"Whenever my wife needs money she calls me handsome."

"Handsome?"

"Yeah—hand some over!"

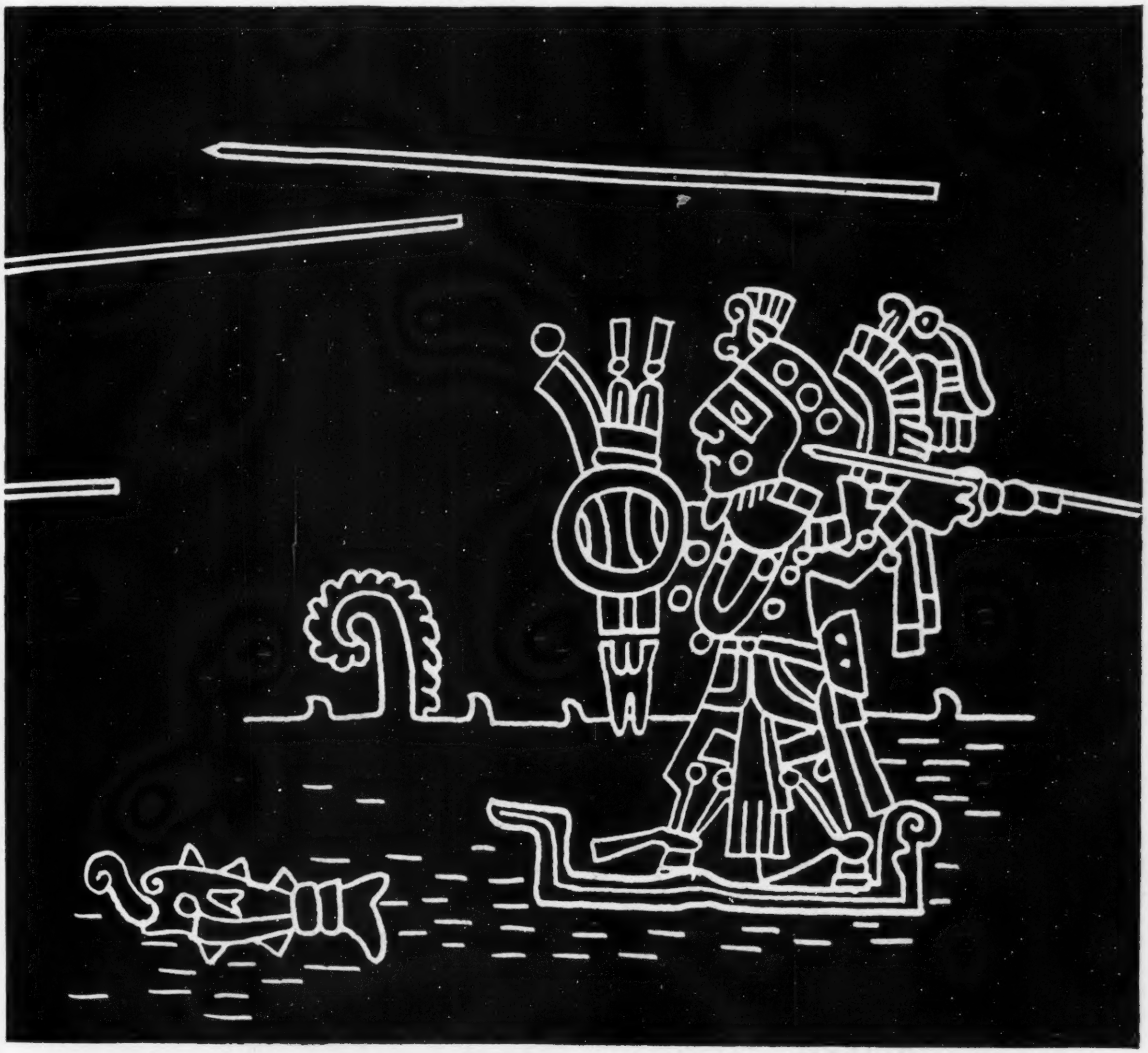
* * *

*The narrow road where two cars could hardly pass without colliding has now been replaced by modern super-highways where six or eight cars can collide at once.*

* * *

"Was your friend shocked over the death of his mother-in-law?"

"Shocked; he was electrocuted."



# Index to Volume 12

## Articles



## Authors



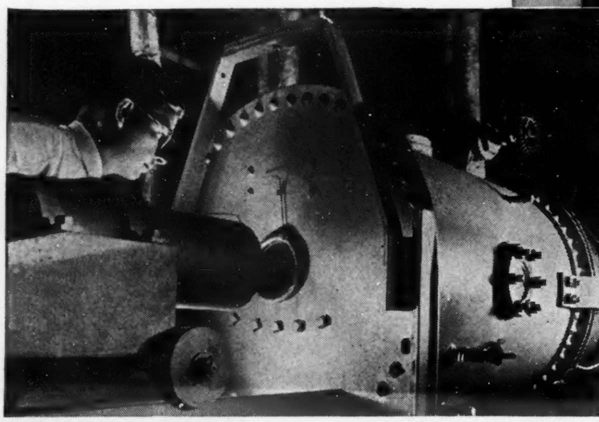
## Personalities

# Du Pont *Digest*

**Items of Interest to Students of Science and Engineering**

# Explosives—an essential industrial tool


A. L. St. Peter, Princeton '37, supervisor blasting operation Susquehanna River Project, lowers a 5½ inch "Nitramon" Primer into one of 600 drill holes preparatory to blasting a pipe line ditch.



Frank A. Loving, Chemical Engineer, Texas A & M '41, prepares to fire an explosive charge into a chamber of methane or dusty air to test safety under conditions found in coal mines.

INDUSTRIAL explosives are as much of a yardstick of industrial progress as sulfuric acid. They are involved in the fabrication of nearly all the products used by man. This year the United States will use over 500 million pounds of industrial explosives.

The technical problems that confront the explosives industry are many and varied. A measure of this is the fact that the Du Pont Company manufactures about two hundred dynamite formulations, each intended to do a different job, from the slow heaving action of blasting coal to the rapid, violent shattering necessary for a hard ore. Ranging between these two extremes are a large number of intermediate grades, including explosives especially formulated for agricultural work, seismic prospecting for oil, submarine blasting—right down to the tiny charge used in an explosive rivet.

### Studies in Laboratory and Field

One of the first industrial laboratories for chemical research in the United States, the Eastern laboratory of the Du Pont Explosives Department has nearly two hundred chemists, engineers, physicists and assistants. There, methods have been developed for measuring the power of explosives, the degree to which they shatter or pulverize various materials, their water resistance, their safety characteristics when exposed to shock or flame, the composition of the gases they produce, etc. As a result of studies of the influence of various factors on dynamite performance, it has become possible to formulate an explosive to meet practically any blasting condition.

In keeping with these improvements, the application of explosives has reached a new level of efficiency. Technical service men, usually mining engineers or civil engineers, aid consumers in the selection and use of explosives. They also work closely with research men in solving unusual problems encountered in the field.

### Research—Path to Progress

A few of the results gained through research are: (1) lowering of dynamite freezing points by nitrating ethylene glycol along with glycerol to diminish the hazards of thawing frozen dynamites. (2) Production of less hazardous dynamites by substituting ammonium nitrate partially for nitroglycerine, in spite of the greater hygroscopicity and lesser explosive power of the former. This resulted in dynamites less hazardous to manufacture and use. (3) Introduction of "Nitramon," a blasting agent containing a high percentage of ammonium nitrate as its major ingredient. It is equal in strength to the most powerful dynamites commonly employed and yet is by far the safest blasting agent available. (4) Development of explosives with a minimum of noxious gases for use in confined areas. (5) Numerous improvements in the composition, manufacture and design of the blasting caps which set off the main charge.

Aside from these developments in explosives and blasting supplies, there have been many accomplishments in chemistry and engineering associated with such projects as the oxidation of ammonia to nitric acid; manufacture, granulation and drying of ammonium nitrate; substitutes for nitroglycerine and ethylene glycol dinitrate, concentration of nitric and sulfuric acids, and a host of other subjects.

**Questions College Men ask about working with Du Pont**

**WHAT ARE THE OPPORTUNITIES FOR RESEARCH MEN?**

Unusual advantages in facilities and funds are available to men qualified for fundamental or applied research. Investigation in the fields of organic, inorganic and physical chemistry, biology, parisitology, plant pathology and engineering suggest the wide range of activities. Write for booklet, "The Du Pont Company and the College Graduate," 2521 Nemours Building, Wilmington 98, Delaware.

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*More facts about Du Pont*—**Listen to "Cavalcade of America," Mondays, 8 P.M. EDST, on NBC**

**BETTER THINGS FOR BETTER LIVING**
***...THROUGH CHEMISTRY***

## *Campus to* GENERAL ELECTRIC

# TOMORROW'S APPLIANCES

*The Story of*

## JIM YOUNG


THE General Electric refrigerators, ranges, washers and other appliances that homemakers will be buyng in 1950 are already under development. James F. Young, ten years out of Lafayette College's mechanical engineering school, supervises the engineering of these appliances-to-come.

Jim, graduating magna cum laude, chose General Electric's job offer over others because, as he says, "G.E. offered more different fields of engineering, had a better program than any other company, and could provide better experience."

The varied experience that Jim sought came to him fast. While on "Test" with G.E., he worked in four different plants and at six different assignments, ranging from supercharger tests to studies in unbalance of hydraulic systems. Following "Test" he enrolled in the G-E Creative Engineering Program and drew five assignments in laboratories and design departments.

When he had completed the course he was appointed supervisor of it. While organizing this course and lecturing to the class, he studied another—the C course in mechanical engineering. He also wrote and edited "Materials and Processes," published in 1944.

His first "real work," he says, was in helping to develop large-size rocket launchers, both airborne and land types. The creative engineering ability he showed on this assignment, and on later problems, insured his steady progress to the top of the Advance Engineering Section of his company's Appliance and Merchandise Dept.

**Next to schools and the U.S. Government, General Electric employs more college engineering graduates than any other organization.**

Jim became interested in mechanical problems early. In his teens he found a hobby in rebuilding old autos.

As an early job with G.E. he organized and taught engineering courses, became supervisor of all mechanical engineering training.

During the war he helped develop the airborne rocket launcher, important factor in smashing Nazi armor. A second war job: development of gyroscopes for torpedoes.

Today Jim supervises the engineering of G-E household appliances to be marketed two to five years from now. He still directs the training of many new engineers.

**GENERAL ELECTRIC**

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